Operation

DC Generator Sets

Models:

6VSG

24VDC
36VDC
48VDC

Controller:

VSC

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

KOHLER® Power Systems

TP-6843 7/15b

California Proposition 65

⚠ WARNING

Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

Product Identification Information

Product identification numbers determine service parts. Record the product identification numbers in the spaces below immediately after unpacking the products so that the numbers are readily available for future reference. Record field-installed kit numbers after installing the kits.

Generator Set Identification Numbers

Record the product identification numbers from the generator set nameplate(s).

Model Designation _____

Specification Number _____

Serial Number _____

Accessory Number	Accessory Description
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Controller Identification

Record the controller description from the generator set operation manual, spec sheet, or sales invoice.

Controller Description _____

Engine Identification

Record the product identification information from the engine nameplate.

Manufacturer _____

Model Designation _____

Serial Number _____

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IMPORTANT SAFETY INSTRUCTIONS Electro-mechanical equipment, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely. Read and follow all safety precautions and instructions. SAVE THESE INSTRUCTIONS.

This manual has several types of safety precautions and instructions: Danger, Warning, Caution, and Notice.

⚠ DANGER

Danger indicates the presence of a hazard that ***will cause severe personal injury, death, or substantial property damage***.

⚠ WARNING

Warning indicates the presence of a hazard that ***can cause severe personal injury, death, or substantial property damage***.

⚠ CAUTION

Caution indicates the presence of a hazard that ***will*** or ***can cause minor personal injury*** or ***property damage***.

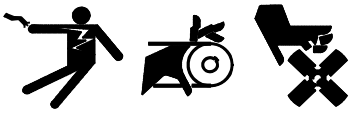
NOTICE

Notice communicates installation, operation, or maintenance information that is safety related but not hazard related.

Safety decals affixed to the equipment in prominent places alert the operator or service technician to potential hazards and explain how to act safely. The decals are shown throughout this publication to improve operator recognition. Replace missing or damaged decals.

Accidental Starting

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Press the generator set OFF/RESET button to shut down the generator set. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

Battery

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

⚠ WARNING

Explosion.
Can cause severe injury or death.
Relays in the battery charger cause arcs or sparks.

Locate the battery in a well-ventilated area. Isolate the battery charger from explosive fumes.

Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death. Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery. Never connect the negative (–) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

Engine Backfire/Flash Fire

⚠ WARNING

Risk of fire.
Can cause severe injury or death.

Do not smoke or permit flames or sparks near fuels or the fuel system.

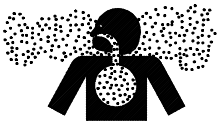
Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner removed.

Servicing the fuel system. A flash fire can cause severe injury or death. Do not smoke or permit flames or sparks near the carburetor, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors. Catch fuels in an approved container when removing the fuel line or carburetor.

Combustible materials. A fire can cause severe injury or death. Generator set engine fuels and fuel vapors are flammable and explosive. Handle these materials carefully to minimize the risk of fire or explosion. Equip the compartment or nearby area with a fully charged fire extinguisher. Select a fire extinguisher rated ABC or BC for electrical fires or as recommended by the local fire code or an authorized agency. Train all personnel on fire extinguisher operation and fire prevention procedures.

Exhaust System

⚠ WARNING



Carbon monoxide.
Can cause severe nausea, fainting, or death.

The exhaust system must be leakproof and routinely inspected.

Generator set operation. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Avoid breathing exhaust fumes when working on or near the generator set. Never operate the generator set inside a building. Never operate the generator set where exhaust gas could seep inside or be drawn into a potentially occupied building through windows, air intake vents, or other openings.

Carbon monoxide detectors. Carbon monoxide can cause severe nausea, fainting, or death. Install carbon monoxide detectors on each level of any building adjacent to the generator set. Locate the detectors to adequately warn the building's occupants of the presence of carbon monoxide. Keep the detectors operational at all times. Periodically test and replace the carbon monoxide detectors according to the manufacturer's instructions.

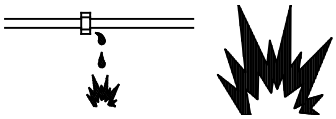
Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Carbon monoxide poisoning symptoms include but are not limited to the following:

- Light-headedness, dizziness
- Physical fatigue, weakness in joints and muscles
- Sleepiness, mental fatigue, inability to concentrate or speak clearly, blurred vision
- Stomachache, vomiting, nausea

If experiencing any of these symptoms and carbon monoxide poisoning is possible, seek fresh air immediately and remain active. Do not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. Seek medical attention if the condition of affected persons does not improve within minutes of breathing fresh air.

Fuel System

WARNING



Explosive fuel vapors.
Can cause severe injury or death.

Use extreme care when handling, storing, and using fuels.

The fuel system. Explosive fuel vapors can cause severe injury or death. Vaporized fuels are highly explosive. Use extreme care when handling and storing fuels. Store fuels in a well-ventilated area away from spark-producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks. Do not smoke or permit flames or sparks to occur near sources of spilled fuel or fuel vapors. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid fuel line breakage caused by vibration. Do not operate the generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair fuel systems before resuming generator set operation.

Gas fuel leaks. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Check the LP vapor gas or natural gas fuel system for leakage by using a soap and water solution with the fuel system test pressurized to 6-8 ounces per square inch (10-14 inches water column). Do not use a soap solution containing either ammonia or chlorine because both prevent bubble formation. A successful test depends on the ability of the solution to bubble.

Hazardous Noise

CAUTION

Hazardous noise.
Can cause hearing loss.

Never operate the generator set without a muffler or with a faulty exhaust system.

Engine noise. Hazardous noise can cause hearing loss. Generator sets not equipped with sound enclosures can produce noise levels greater than 105 dBA. Prolonged exposure to noise levels greater than 85 dBA can cause permanent hearing loss. Wear hearing protection when near an operating generator set.

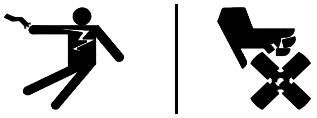
Hazardous Voltage/Moving Parts

DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

WARNING



Hazardous voltage. Moving parts.
Can cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

WARNING

Hazardous voltage.
Backfeed to the utility system can cause property damage, severe injury, or death.

If the generator set is used for standby power, install an automatic transfer switch to prevent inadvertent interconnection of standby and normal sources of supply.

CAUTION

Welding the generator set.
Can cause severe electrical equipment damage.

Never weld components of the generator set without first disconnecting the battery, controller wiring harness, and engine electronic control module (ECM).

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Welding on the generator set. Can cause severe electrical equipment damage. Before welding on the generator set perform the following steps: (1) Remove the battery cables, negative (–) lead first. (2) Disconnect all engine electronic control module (ECM) connectors. (3) Disconnect all generator set controller and voltage regulator circuit board connectors. (4) Disconnect the engine battery-charging alternator connections. (5) Attach the weld ground connection close to the weld location.

Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Heavy Equipment

⚠ WARNING

Unbalanced weight.
Improper lifting can cause severe injury or death and equipment damage.

Do not use lifting eyes.
Lift the generator set using lifting bars inserted through the lifting holes on the skid.

Hot Parts

⚠ WARNING

Hot engine and exhaust system. Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

Servicing the engine heater. Hot parts can cause minor personal injury or property damage. Install the heater before connecting it to power. Operating the heater before installation can cause burns and component damage. Disconnect power to the heater and allow it to cool before servicing the heater or nearby parts.

This manual provides operation and maintenance instructions for the DC (direct current) variable speed model 6VSG generator sets equipped with Kohler VSC generator set controllers.

This generator set is approved for use in stationary applications in locations served by a public utility, photovoltaic cells, wind turbines or any combination of power sources tied to a battery bank. Have the generator set installed by an authorized distributor/dealer or service technician. Refer to Installation Manual, for installation instructions.

Information in this publication represents data available at the time of print. Kohler Co. reserves the right to change this publication and the products represented without notice and without any obligation or liability whatsoever.

Read this manual and carefully follow all procedures and safety precautions to ensure proper equipment operation and to avoid bodily injury. Read and follow the Safety Precautions and Instructions section at the beginning of this manual. Keep this manual with the equipment for future reference.

The equipment service requirements are very important to safe and efficient operation. Inspect the parts often and perform required service at the prescribed intervals. Obtain service from an authorized service distributor/dealer to keep equipment in top condition.

Figure 1 6VSG Generator Set

List of Related Literature

Figure 2 identifies related literature available for the generator sets covered in this manual. Only trained and qualified personnel should install or service the generator set.

Literature Type	Part Number
Installation Manual, Model 6VSG Generator Set	TP-6842
Service Manual, 6VSG Generator Set	TP-6844
Operation Manual, OnCue® Software	TP-6796
Operation Manual, SiteTech™ Software	TP-6701
Installation Instructions, Programmable Interface Module (PIM)	TT-1584
Parts Catalog, Model 6VSG	TP-6845

Figure 2 Related Literature

Nameplate

The following illustration shows a typical generator set nameplate. Copy the model, serial, and specification numbers from the nameplate into the spaces provided in the product information section on the inside front cover of this manual. See the service views in Section 1.7 for the nameplate location.

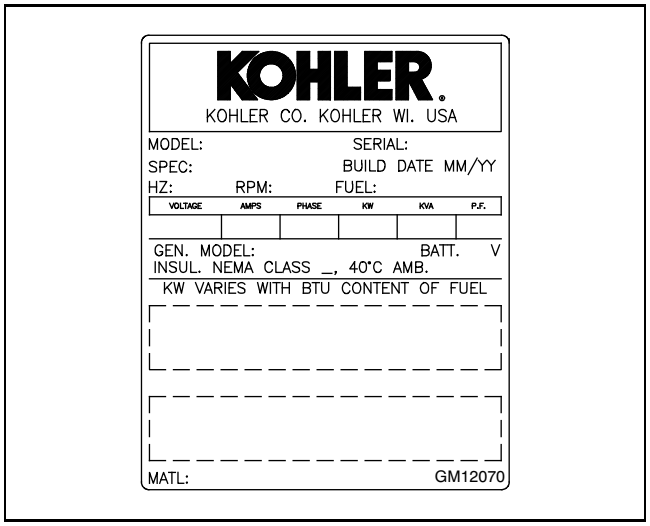


Figure 3 Typical Nameplate

Emission Information

The Kohler Model CH740 engine used on the 6VSG generator set is certified to operate using natural gas or LPG fuel.

The Emission Compliance Period referred to on the Emission Control or Air Index label indicates the number of operating hours for which the engine has been shown to meet CARB or EPA emission requirements. Figure 4 provides the engine compliance period (in hours) associated with the category descriptor, which may be found on the certification label.

Emission Compliance Period			
EPA	Category C 250 hours	Category B 500 hours	Category A 1000 hours
CARB	Moderate 125 hours	Intermediate 250 hours	Extended 500 hours

Figure 4 Emission Compliance Period

Refer to the certification label for engine displacement. The exhaust emission control system for the CH740 engines (6VSG) is EM for U.S. EPA, California, and Europe. See Figure 1-2 for engine certification label location.

Service Assistance

For professional advice on generator set power requirements and conscientious service, please contact your nearest Kohler distributor or dealer.

- Consult the Yellow Pages under the heading Generators—Electric.
- Visit the Kohler Power Systems website at KOHLERPower.com.
- Look at the labels and decals on your Kohler product or review the appropriate literature or documents included with the product.
- Call toll free in the US and Canada 1-800-544-2444.
- Outside the US and Canada, call the nearest regional office.

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Fax: (86) 10 6518 7955

East China Regional Office, Shanghai

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India, Bangladesh, Sri Lanka

India Regional Office
Bangalore, India

Phone: (91) 80 3366208
(91) 80 3366231

Fax: (91) 80 3315972

Japan, Korea

North Asia Regional Office
Tokyo, Japan

Phone: (813) 3440-4515

Fax: (813) 3440-2727

Latin America

Latin America Regional Office
Lakeland, Florida, USA

Phone: (863) 619-7568

Fax: (863) 701-7131

Notes

1.1 Introduction

The generator set specification sheets provide specific generator and engine information. Refer to the spec sheet for data not supplied in this manual. Consult the generator set service manual, engine operation manual, and engine service manual for additional specifications. Obtain copies of the latest spec sheets, manuals, diagrams, and drawings from your local distributor/dealer.

1.2 Engine

The generator set has a four-cycle, twin cylinder, air-cooled Kohler engine. The engine operates on cleanburning natural gas or LPG fuel. Engine features include:

- Efficient overhead valve design and full pressure lubrication for maximum power, torque, and reliability under all operating conditions.
- Dependable, maintenance-free electronic ignition.
- Precision-formulated cast iron construction of parts subjected to the most wear and tear.
- Field-convertible multi-fuel systems that allow fuel changeover from natural gas to LPG (and vice versa) while maintaining CARB emission certification.
- The variable-speed engine runs at 2300 rpm at no load and 2900 rpm when supplying full load.

1.3 Generator Set Enclosure

The generator set is housed in a steel enclosure with Power Armor powder coat paint. The enclosure has a hinged, locking door that allows easy access to the generator set controller when required, but locks securely to prevent unauthorized access.

To open the door, insert the tool provided with the enclosure and turn counterclockwise 1/2 turn.

Be sure to close and lock the enclosure, and keep the tool in a secure location.

1.4 Alternator

The 6VSG is a direct current (DC) output machine. It utilizes a 24-pole permanent magnet construction to create high frequency three-phase alternating current which is rectified to produce low-ripple DC output.

1.5 Controller

The Model 6VSG generator set comes equipped with the VSC controller. See Figure 1-1 . The controller provides integrated control for the generator set and the optional programmable interface module (PIM) or optional communications kit interface board.

The controller's two-line LCD screen displays status messages and system settings that are clear and easy to read in all lighting conditions, including direct sunlight and low light.

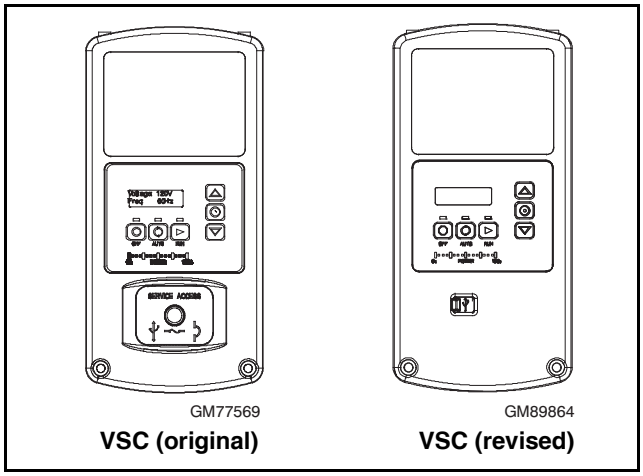


Figure 1-1 VSC Controller

1.5.1 VSC Controller Features

- Six-button keypad
  - OFF, AUTO, and RUN pushbuttons
  - Select and arrow buttons for access to system configuration and adjustment menus
- LED indicators for OFF, AUTO, and RUN modes
- LED indicators for percentage of load being output
- LCD display
  - Two lines x 16 characters per line
  - Backlit display with adjustable contrast for excellent visibility in all lighting conditions
- Scrolling system status display
  - Generator set status

- Voltage and percent load
- Engine temperature
- Oil pressure
- Battery voltage
- Engine runtime hours

- Date and time displays
- Smart engine cooldown senses engine temperature
- Digital voltage regulation: ±1.0% RMS no-load to full-load
- Automatic start with programmed cranking cycle
- Programmable exerciser can be set to start automatically on any future day and time, and run every week or every two weeks
- Three exercise modes
- Front-access mini USB connector for SiteTech™ connection
- Integral Ethernet connector for Kohler® OnCue®
- Built-in 2.5 amp battery charger
- Remote two-wire start/stop capability
- Diagnostic messages
  - Displays diagnostic messages for the engine, generator, and programmable interface module (PIM)
  - Over 70 diagnostic messages can be displayed
- Maintenance reminders
- System settings
  - System voltage and percent load
  - Voltage adjustment
  - Measurement system, English or metric
- Programmable Interface Module (PIM) status displays
  - Input status (active/inactive)
  - Output status (active/inactive)

1.6 Accessories

The following optional accessories are offered for the 6VSG generator sets.

1.6.1 Carburetor Heater

An optional carburetor heater is recommended for improved cold starting in locations where the ambient temperature drops below 0°C (32°F). The carburetor heater prevents condensation and carburetor icing. The heater requires a continuous source of AC power.

See the generator set Installation manual for more information.

1.6.2 OnCue® Generator Management System

The Kohler® OnCue® Generator Management System allows monitoring and control of your 6VSG generator set from a personal computer located in your home or at other remote locations. OnCue® can also be configured to send email or text message notifications in the event of a generator set fault.

Note: Be sure to obtain the correct version of the OnCue® kit for the VSC controller.

OnCue® version 3.1 or higher is required for 6VSG generator sets.

1.6.3 Programmable Interface Module (PIM)

The optional Programmable Interface Module (PIM) provides two programmable inputs and six programmable dry contact outputs for connection to customer-supplied equipment. The outputs are controlled by the VSC controller, and can also be controlled remotely using the OnCue® program.

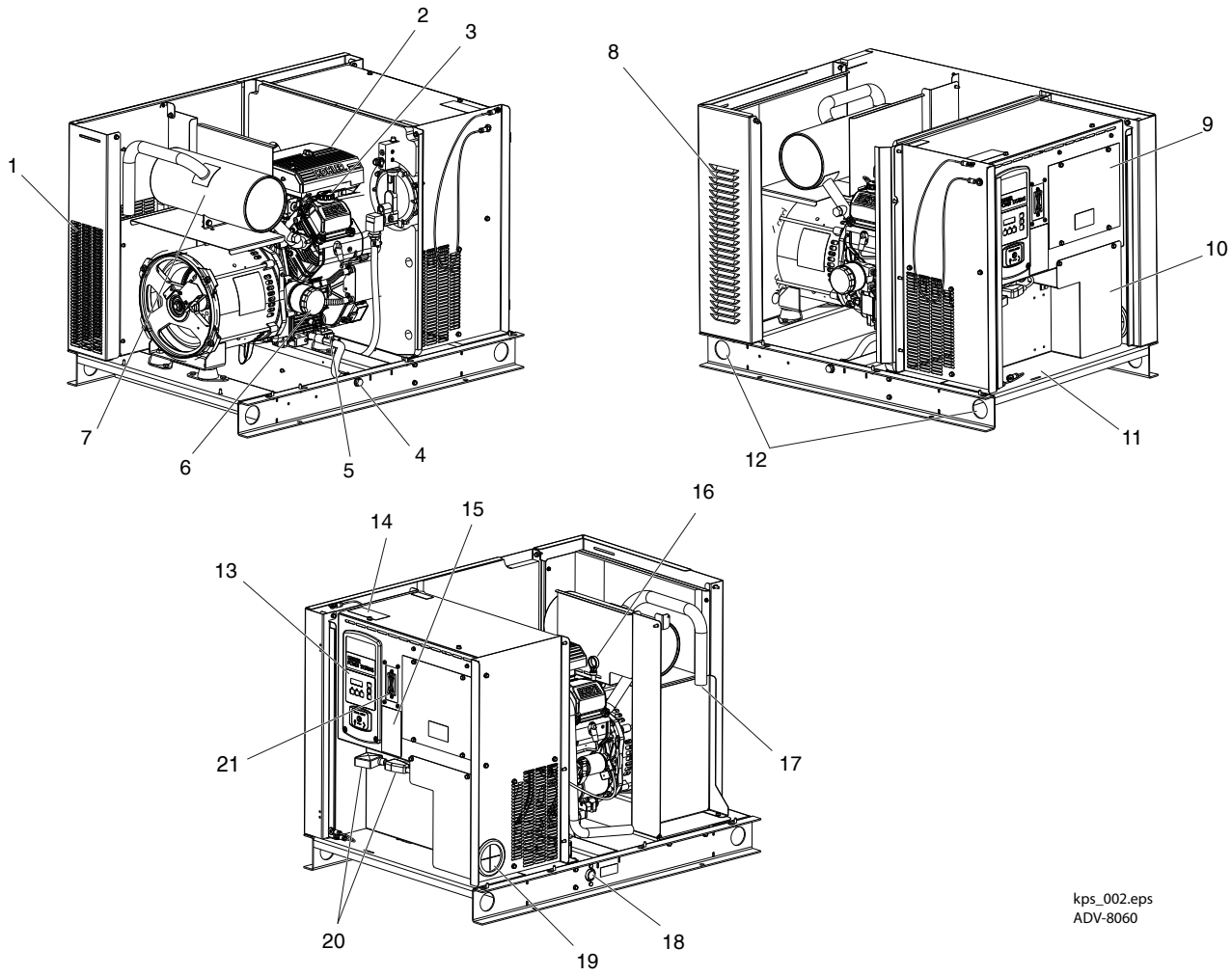
The PIM is mounted in a NEMA 3R aluminum enclosure, which can be mounted indoors or outdoors. See the installation instructions provided with the PIM.

1.6.4 Communications Kit

The optional communications kit includes the following factory-installed items:

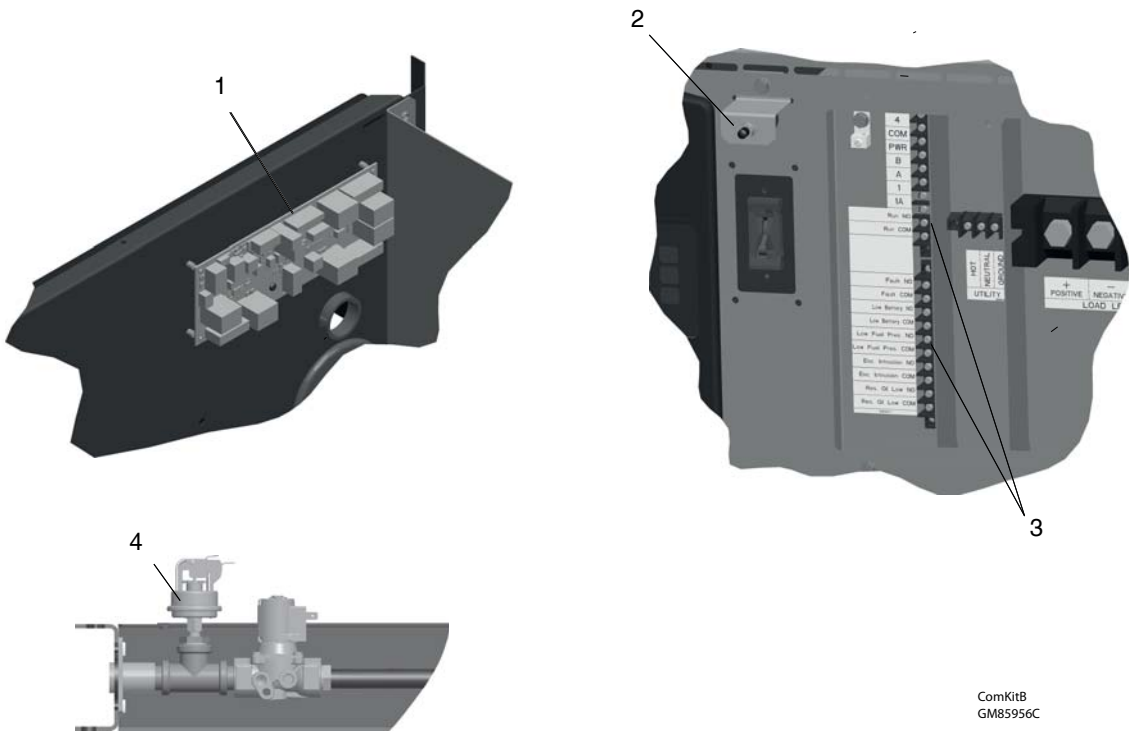
- Interface board with factory-set inputs and outputs and customer connection terminal blocks
- Fuel pressure switch
- Enclosure intrusion alarm switch

1.7 Service Views



1. Exhaust air outlet
2. Air cleaner
3. Oil fill
4. Oil drain
5. Oil drain valve
6. Oil filter
7. Muffler
8. Alternator air inlet
9. Customer connection blocks (located behind panel)
10. Electrical inlet access panel
11. Engine starting battery location (battery not included)
12. Lifting hole
13. Controller
14. Engine certification label
15. Load circuit breaker
16. Oil dipstick
17. Exhaust outlet
18. Fuel inlet
19. Electrical inlet
20. Battery cables (included)
21. Nameplate

Figure 1-2 Service View (see Figure 1-3 for optional communications kit components)



1. Interface board (factory-wired to terminal blocks)
2. Intrusion alarm switch
3. Interface board input and output connection terminal blocks
4. Fuel pressure switch

Figure 1-3 Optional Communications Kit Components

2.1 Theory of Operation

The generator set utilizes a permanent-magnet alternator to produce 3-phase AC voltage. This voltage is rectified using a full-wave 3-phase rectifier (single block rectifier for 36V and 48V, three individual rectifier blocks for 24V) to produce low-ripple DC output. See Figure 2-1 and Figure 2-2.

The VSC measures the average DC voltage on the output and lists this on the auto-scrolling display, in the Overview menu and in the Generator metering menu.

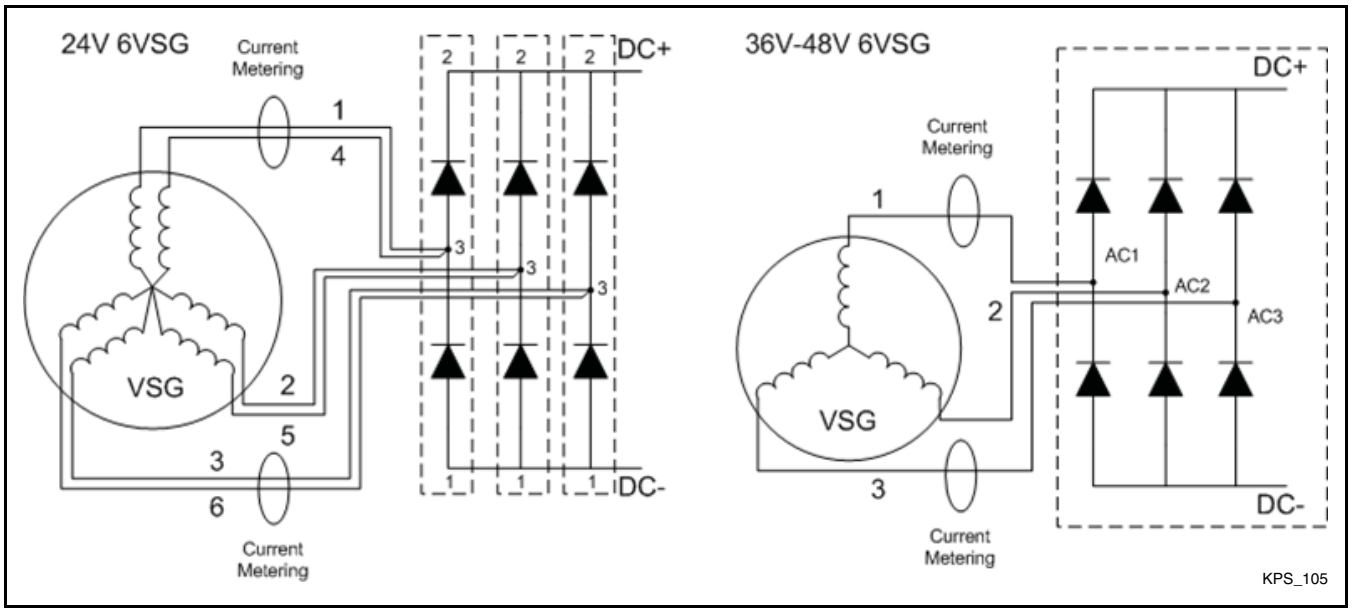


Figure 2-1 Basic VSG Power Connections

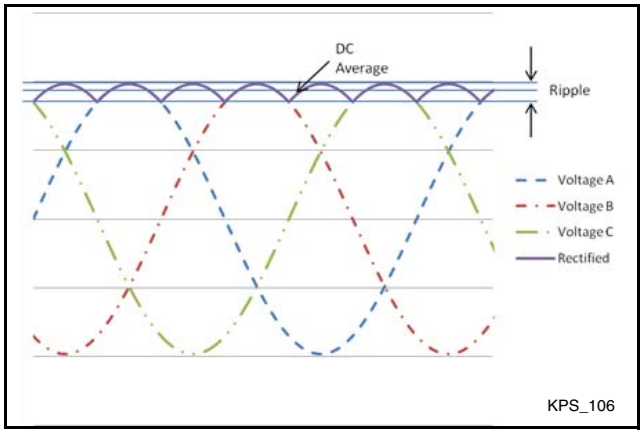


Figure 2-2 Output Waveform, with Rectified Signal

The voltage is regulated to maintain a constant output voltage, which is equal to the System Voltage setting. When the load on the 6VSG generator increases, the generator controller increases the engine speed. The 6VSG series is designed to produce rated voltage at 2300 rpm with no load and at 2900 rpm when supplying full load. The output current and power increase with the engine speed. The engine speed is limited to a maximum of 3300 rpm. See Section 3.14.1 for more information.

2.2 Prestart Checklist

To ensure continued satisfactory operation, perform the following checks or inspections before or at each startup, as designated, and at the intervals specified in the service schedule. In addition, some checks require verification after the unit starts.

Air Cleaner. Check for a clean and installed air cleaner element to prevent unfiltered air from entering the engine.

Air Inlets. Check for clean and unobstructed air inlets.

Battery. Check for tight battery connections. Consult the battery manufacturer's instructions regarding battery care and maintenance.

Enclosure. Check that all enclosure panels and internal baffling are in place.

Exhaust System. Check for exhaust leaks and blockages. Check the muffler condition.

- Inspect the exhaust system components for cracks, leaks, and corrosion. Check for tight exhaust system connections.
- Check for corroded or broken metal parts and replace them as needed.
- Check that the exhaust outlet is unobstructed.

Oil Level. Check the oil level before starting the generator set and at the intervals given in Section 4, Scheduled Maintenance. Maintain the oil level at or near, not over, the full mark on the dipstick.

Operating Area. Check for obstructions that could block the flow of cooling air. Keep the air intake area clean. Do not leave rags, tools, or debris on or near the generator set.

2.3 Exercising the Generator Set

Operate the generator set without load once each week or every 2 weeks for 20 minutes. See Section 2.5, Exercise. For instructions to set the exerciser, see Section 3.6.

2.4 Generator Set Operation

2.4.1 Local Starting and Stopping

Start: Press the RUN button to immediately start the generator set.

Stop: Press the OFF button. The engine stops.

Run the generator set with no load for at least 2 minutes to ensure adequate engine cooldown.

2.4.2 Remote Starting and Stopping

The generator set must be in automatic mode for remote operation. Press the AUTO button on the VSC controller.

A remote switch connected to terminals 3 and 4 can be used to start and stop the generator set. Close the switch to start and run the generator set. Open the switch to stop the generator set.

Run the generator set with no load for at least 2 minutes to ensure adequate engine cooldown.

2.4.3 Engine Start Crank Cycle

The controller attempts to start the generator set three times (three crank cycles, 15 seconds crank and 15 seconds off). If the generator set does not start in three attempts, the system shuts down on an overcrank fault. See Section 2.6.

Cranking 1, 2, and 3 are displayed during the crank cycle. Pressing the OFF button during the crank cycle stops the cranking. No other buttons are acknowledged during the crank cycle.

2.4.4 Engine Cooldown

The engine cooldown time delay allows the engine to run after the loads have been removed.

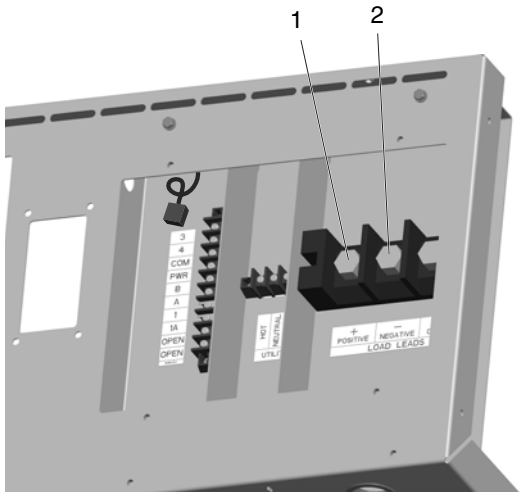
The engine cooldown time delay is set to 5 minutes. The engine stops before the cooldown time delay expires if the temperature drops below the cooled-down temperature level, or if the temperature rises above the high limit during the cooldown cycle.

2.4.5 Automatic Operation

The 6VSG monitors the voltage of a storage battery bank connected to (+) and (–) of the output block to determine charge condition of the storage battery (see Figure 2-3).

- If the storage battery voltage falls below the minimum voltage for more than 3 minutes, or if a remote start command is received, the generator set starts. A remote start command can be activated by closing the remote start contacts across 3 and 4 or by a start exercise command.
- When the generator set load falls below the minimum % load for more than 3 minutes, or a remote stop command is received, the generator set stops. A remote stop command can be caused by opening the remote start contacts across 3 and 4 or by the exercise time ending.

The minimum voltage, minimum load, and time delays are adjustable using a personal computer and Kohler® SiteTech™ software. Contact your Kohler distributor.



1. Positive (+)
2. Negative (–)

Figure 2-3 Output Block

2.5 Exercise

The VSC controllers can be set to automatically run the generator set at the same time and day each week. Exercising the generator set weekly or every two weeks is required to keep the engine and alternator in good operating condition.

When power is applied to the VSC controller (that is, when the battery is connected), you will be prompted to set the date and time, and then to set the exerciser.

See Section 3.1, VSC Generator Set Controller, for more information

An exercise can be started at any time using Kohler® OnCue®, or can start automatically according to the exercise schedule programmed on the VSC controller.

Three exercise modes are available. During some exercise modes the engine speed increases and decreases. This is normal.

1. **Unloaded Full Speed Exercise**. The generator regulates the output load below 5% of capacity. The generator will stop after 20 minutes.
2. **Unloaded Cycle Exercise**. The generator set engine speed varies during the 20-minute exercise according to the following cycle:
   a. The generator set regulates the output load below 5% of capacity for 11 minutes to warm up.
   b. The output regulation is moved to the Genset Maximum Percent Capacity for 3 minutes to test ability to output power.
   c. The load limit is returned to 5% for 6 minutes to allow the generator to cool down before stopping.
3. **Loaded Full Speed Exercise**. The generator operates normally. Voltage is regulated to Voltage Regulator Average Voltage Adjustment, and load is regulated to Genset Maximum Percent Capacity. The generator stops after 20 minutes, regardless of the load on the generator.

2.6 Faults

The VSC controller displays fault messages for generator set warnings and shutdowns. Selected fault messages are shown in Figure 2-5.

2.6.1 Warnings

The controller displays a fault message but the generator set does not shut down on a warning. The controller resets automatically after a warning condition is corrected.

2.6.2 Shutdowns

Under a fault shutdown condition, the generator set shuts down automatically and the controller displays a fault message. The OFF LED flashes. In some cases, the engine cooldown cycle runs before the engine shuts down. See Figure 2-5.

Shutdown switches (such as the low oil pressure switch or high engine temperature switch) on the generator set will automatically reset when the problem is corrected. However, the fault condition at the controller does not clear until the controller is reset.

The generator set cannot be restarted until the fault condition is corrected and the controller is reset. See Section 2.6.3 for instructions to reset the controller after a fault shutdown.

2.6.3 Resetting the Controller After a Fault Shutdown

Always identify and correct the cause of a fault shutdown before resetting the controller. Check the fault message displayed on the controller and refer to Figure 2-5 to identify and correct the fault condition before proceeding. Contact an authorized distributor/dealer for service, if necessary.

Press the OFF button to reset the controller, or follow the procedure below. See Figure 2-4.

1. While the fault message is displayed, press the Select button to go to the Overview menu.
2. Press Select again. The active fault message is displayed.
3. Press Select. Confirm Clear Fault: NO is displayed.
4. Press the UP arrow button. Confirm Clear Fault: YES is displayed.
5. Press the Select button to enter YES and clear the fault.
6. Press the Select button to return to the overview menu. The controller changes to OFF mode.
7. Press AUTO to put the generator set into automatic mode.

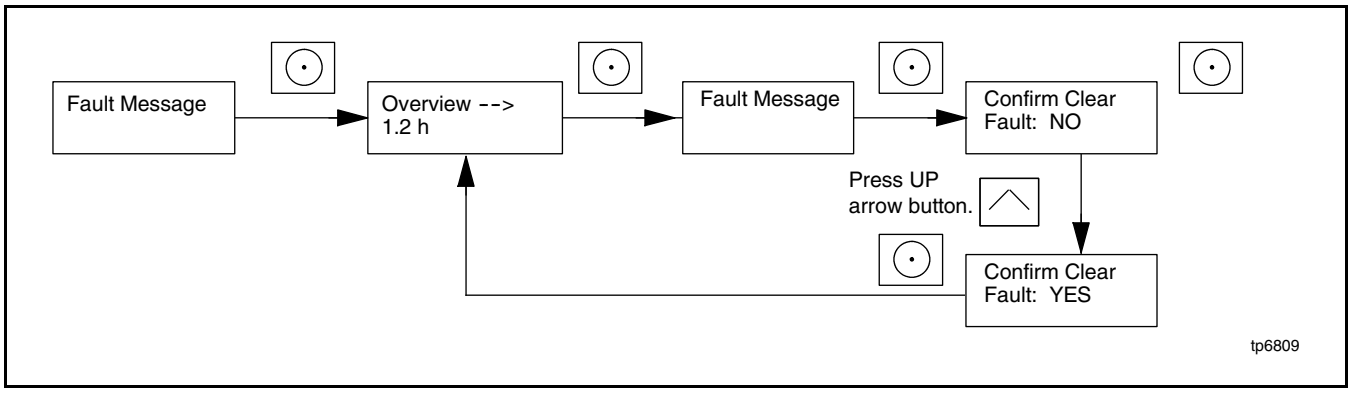


Figure 2-4 Clearing a Fault on the VSC Controller

Fault Message	Warning (W) or Shutdown (SD)	Condition	Check
Accy PwrOver Warning	W	Accessory Power Overload. Too many devices on the accessory power port or an over current fault (short circuit) on the accessory controller power output. (Feeds RBUS devices - PIM)	Contact an authorized distributor/dealer for service.
Aux Input	SD *	Auxiliary input. An optional customer-connected input is closed. (Digital input from optional PIM.)	Check customer-supplied equipment.
Batt Chg Flt	W	Battery charger fault. Input to PIM from an external battery charger (not the built-in battery charger).	Check external battery charger.
Battery Voltage CrLow	W	Engine starting battery voltage is critically low, less than 10.5 VDC.	Check the battery rating and condition. Check the battery charger operation. Charge or replace the battery.
Battery Voltage High	W	Engine starting battery voltage rises above 16 VDC for more than 10 seconds. Inhibited during the engine crank cycle. Clears when the battery voltage returns to an acceptable level.	Check the battery rating and condition. Check the battery charger operation.
Battery Voltage Low	W	Engine starting battery voltage falls below 12.5 VDC for more than 90 seconds when the engine is not running. Not operative during the engine crank cycle. Clears when the battery voltage returns to an acceptable level.	Check the battery rating and condition. Check the battery charger operation. Charge or replace the battery.

Fault Message	Warning (W) or Shutdown (SD)	Condition	Check
Enclosure Intrusion Alarm	W	The enclosure door is open. (Optional communications kit required.)	Check for evidence of unauthorized access to the generator set. Close and lock the enclosure door.
Engine Oil Pressure Low	SD *	The LOP switch indicates low oil pressure for more than 5 seconds. Function becomes active 30 seconds after crank disconnect (30 second inhibit). **Note:** The low oil pressure shutdown does not protect against low oil level. Check the engine oil level regularly as recommended in Section 4.	Check for leaks in the lubrication system. Check the oil level and add oil if the level is low.
Fuel Pressure Low	W	The fuel pressure switch measures low fuel pressure (below 4.5 inches water column). (Optional communications kit required.)	Check fuel supply and fuel lines.
Engine Speed High	SD *	Engine speed exceeds 115% of the normal running speed for more than 0.3 seconds.	Contact an authorized distributor/dealer for service.
Exer Not Sch	W	Exercise not scheduled. No exercise is scheduled on the controller.	See Section 3.6 for instructions to set the exerciser.
Generator VoltageL1-L2 High	SD *	Generator voltage high. Output voltage exceeds 120% of the system nominal voltage for more than 2 seconds.	Contact an authorized distributor/dealer for service.
Lo Crank Vlt	W	Low cranking voltage. Battery voltage falls below 8 VDC for more than 6 seconds while the starter is engaged.	Charge or replace the battery.
Locked Rotor	SD	No engine rotation is sensed during cranking. Shuts down 3 seconds after the fault is detected.	Check the battery. Check for loose connections. Contact an authorized distributor/dealer for service.
MainPwrOverL Shutdown	SD	Main power overload. An over current fault on the controller output (short circuit).	Contact an authorized distributor/dealer for service.
Not in Auto	W	The generator set is not in Automatic (standby) mode. Remote start and stop commands from a transfer switch or remote switch will be ignored.	Press AUTO to place the generator set in Automatic mode, when appropriate.
Over Crank	SD	Three unsuccessful starting attempts.	Check the fuel supply, spark plug, and battery. Check for loose connections. Contact an authorized distributor/dealer for service.
Reserve Oil Empty	W	The oil makeup kit reservoir bottle is empty. (Optional communications kit and oil makeup kit required.)	Add oil to the oil makeup kit reservoir.
Speed Sensor Fault	SD	Engine speed sensing has failed or engine stalled.	Contact an authorized distributor/dealer for service.
* Engine cooldown runs before shutting down.			

Figure 2-5 Controller Fault Messages

Notes

3.1 VSC Generator Set Controller

All 6VSG generator sets are equipped with the VSC generator set controller.

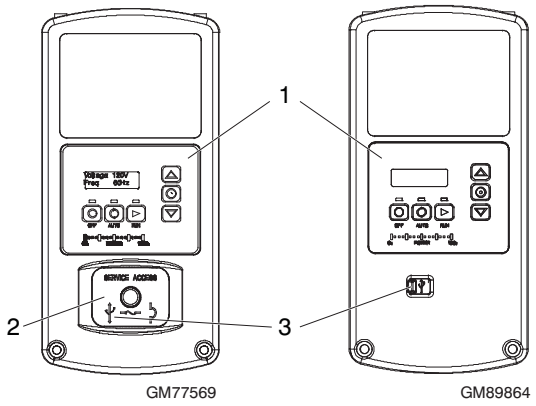
The VSC controls generator set and the optional Programmable Interface Module (PIM) or Communications Kit.

The VSC controller features include:

- Two-line x 16 character backlit digital display with adjustable contrast
- OFF, AUTO, and RUN generator set master control buttons
- Generator set status indicating LEDs (OFF, AUTO, RUN)
- Up, Down, and Select buttons for navigation through menus and adjustments
- Power system indicator LEDs to show power output of the generator

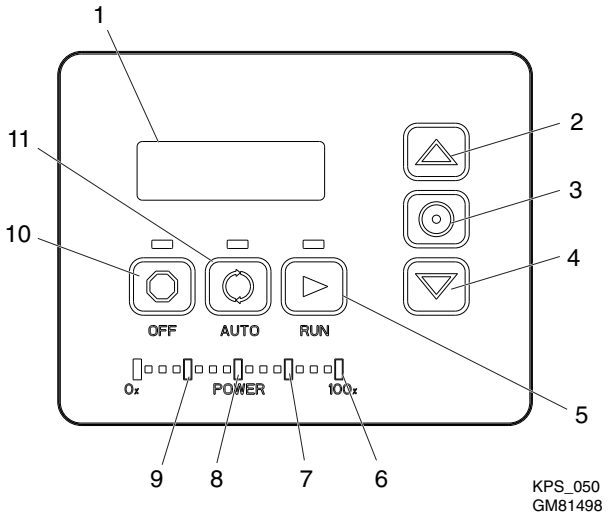
3.2 Control and Indicators

Figure 3-1 illustrates the VSC controller. See Figure 3-2 for details of the controller's user interface.



1. User interface (see Figure 3-2)
2. Service access (see Section 5.4)
3. USB connection

Figure 3-1 VSC Controls and Indicators



1. 2-line LCD display
2. Up button
3. Select button
4. Down button
5. RUN button and LED
6. 100% load LED
7. 75% load LED
8. 50% load LED
9. 25% load LED
10. OFF button and LED
11. AUTO button and LED

Figure 3-2 VSC User Interface

3.2.1 Controller Keypad

The RUN, OFF, and AUTO buttons control the generator set as described in Figure 3-3.

Use the Select, Up arrow, and Down arrow buttons to navigate through the menus and change settings, if necessary. See Section 2.4 for operation instructions.

3.2.2 LED Indicators

LEDs above the RUN, OFF, and AUTO buttons indicate the mode of operation as shown in Figure 3-4.

Load indication LEDs indicate the load on the generator set. A steadily lighted LED indicates that the load on the generator set is greater than or equal to the level label for that LED. The next LED flashes and stays on for a longer time as the load increases.

Button	Button Function
RUN	Starts the generator set. The engine start time delay is ignored.
OFF	Stops the generator set. The cooldown time delay is ignored. During the engine crank cycle, pressing OFF will stop the crank cycle. Press OFF to clear faults and reset the controller.
AUTO	Places the generator set in Automatic (standby) mode.
Down arrow	Use to navigate through menus and change settings. This manual contains instructions to navigate the controller menus and adjust settings on the VSC controller.
Select	
Up arrow	

Figure 3-3 VSC Controller Pushbutton Operation

LED	LED Operation
RUN	Lights when the generator set has been started locally by pressing the RUN button. Remote start and stop commands are ignored.
OFF	Lights for 2 seconds, then flashes every 2 seconds when the generator set and controller are off. Remote start/stop commands have no effect. The exercise cycle will not run.
	In Auto mode, OFF LED flashes quickly to indicate a fault shutdown. Attention required. Identify and correct the fault condition before resetting the controller.
AUTO	Lights when the generator is in automatic (standby) mode. Generator set will respond to engine start and stop commands from the controller (for example, exercise start and stop commands) or an ATS. Time delays operate as described in Section 2.4.
25% load	LED flashes and stays on longer as load increases from 1% to 25%.
50% load	LED flashes and stays on longer as load increases from 26% to 50%.
75% load	LED flashes and stays on longer as load increases from 51% to 75%.
100% load	LED flashes and stays on longer as load increases from 76% to 100%.

Figure 3-4 VSC Controller LED Operation

3.2.3 LCD Display

The controller is equipped with a two-line x 16-character backlit digital display with adjustable contrast. When the generator is running, the controller automatically scrolls through the displays shown in Figure 3-5. The VSC controller measures and displays the average DC output voltage on the auto-scrolling display. When the system is in standby mode and the controller is in AUTO, the screens shown in Figure 3-6 are displayed.

When a fault or warning condition exists, the controller will show the corresponding message. See Section 2.6 for more information about faults.

Controller menus display power system information, including status information for the engine, generator, and optional RBUS accessories, exercise settings, and event history. Some menus allow changes to the controller settings. See Sections 3.7 through 3.18 for menu diagrams.

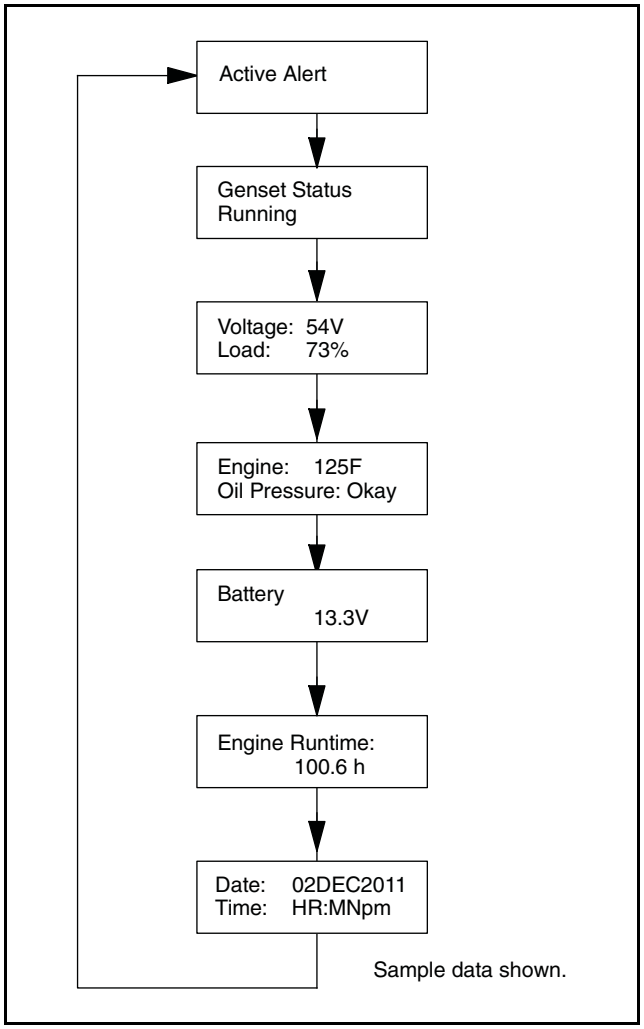


Figure 3-5 Autopaging Displays, Generator Running

The display contrast is adjustable. Navigate to the Genset System menu and step down to the Contrast screen. Press the Select button, and then use the up and down arrow buttons to adjust the contrast. See Section 3.5, Changing Settings, and Section 3.14, Genset System Menu.

The display backlight turns off after about a minute of no activity. The backlight turns on when a button is pressed or when the generator set starts.

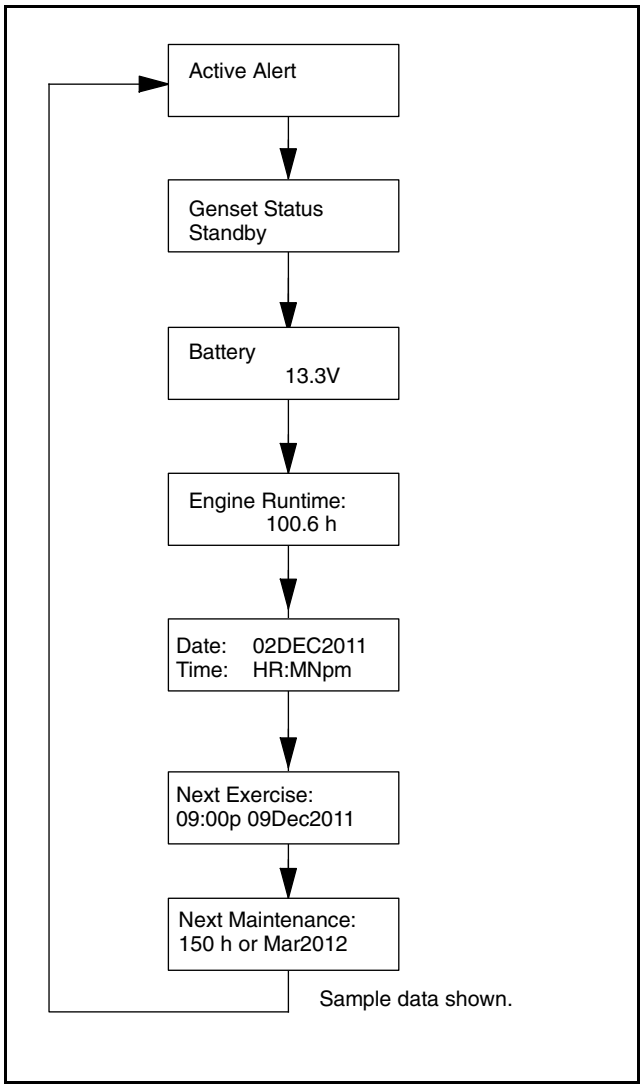


Figure 3-6 Autopaging Displays, Automatic Mode

3.3 Controller Power

The VSC controller is powered by the generator set engine starting battery and the built-in battery charger.

Note: To disconnect controller power, disconnect the AC power to the generator set starting battery.

If controller power is disconnected and reconnected, you will be prompted to set the time, date, and exerciser. The first setting will flash. Press the Up and Down arrow buttons to change the setting. Press Select to save the setting and move on to the next. Repeat until all settings are saved and the controller returns to the main menu. See Section 3.5 for more detailed instructions to change settings on the VSC. See Section 3.6 for more detailed instructions to set the exerciser or change the exercise settings.

3.4 Battery Charging

The controller includes a built-in battery charger to maintain the engine starting battery. The VSC controller monitors the battery voltage and provides a constant 13.8 ±2% VDC voltage and maximum 2.5 amps to charge the battery.

The installer must connect 120 VAC/60Hz power on a breaker-protected circuit for the built-in battery charger.

3.5 Changing Settings

Some settings can be changed from the controller keypad. The controller settings and generator set output are factory-set and should not require field adjustment under normal circumstances. Check and adjust the settings and/or output when:

- The controller has been replaced.
- The voltage requires adjustment for a particular application.
- Troubleshooting generator set problems.

Have controller setup and adjustment performed only by an authorized Kohler distributor/dealer or authorized representative.

The following procedure explains how to change settings. See Figure 3-7 for an example using the Date and Time settings.

Note: Use caution when navigating the controller menus. In some menus, pressing the Select button can enable editing of the controller settings. Changing the settings to incorrect values can adversely affect generator set operation or render the unit inoperable.

3.5.1 Procedure to Change Settings

1. Press the Select button to enter the main menu.
2. Press the down arrow button until the desired menu is displayed.
3. Press the Select button to enter the genset system displays. See Figure 3-10.
4. Press the down arrow button to step through the generator set system settings.
5. To change any of the genset system settings, press the Select button. The selected setting flashes.
6. Press the up or down arrow buttons to increase or decrease the setting.
7. When the desired setting is shown, press Select. The value stops flashing. If there are additional adjustable settings on the screen, the next setting flashes. For example, in the date menu, the day, month, and year can be adjusted. The settings are saved on completion of step 7.
8. Repeat steps 6 and 7 for each setting on the screen.
9. Press the down arrow to step to the next screen.
10. To exit, press the down arrow button until Return is displayed. Press the Select button to exit the menu.
11. Press the AUTO or OFF button to exit the main menu.

    Note: If no buttons are pushed, the controller exits the menus and returns to the generator set status display after 5 minutes.

Changing Date/Time

1. Press the Select button to enter the main menu.

Press: Display:

```
Overview -->
1.2 h
```

2. Press the down arrow button until the desired menu is displayed. See Figure 3-9. Date and Time are used for this example.

Press: Display:

```
Date      -->
and Time
```

3. Press the Select button to enter the Date and Time menu.

Press: Display:

```
Date:
05Dec2011
```

4. To change the date and time settings, press the Select button again. The year will flash.

Press: Display:

```
Date:
05Dec2011
```

5. Press the up or down arrow buttons to change the year.

Press: OR Display:

```
Date:
05Dec2012
```

6. When the correct year is shown, press the Select button. The year is saved and the next setting (month) flashes.

Press: Display:

```
Date:
05Dec2012
```

7. Repeat steps 5 and 6, using the arrow and select buttons to set the month and the date.

8. When the correct date is shown, press the Select button. The saved date is shown.

Press: Display:

```
Date:
03Jan2012
```

9. Press the down arrow button to step to the next menu.

Press: Display:

```
Time:
01:49pm
```

10. Repeat steps 5 and 6, using the arrow and select buttons to set and save the time.

Note: To change from am to pm, press the up arrow key to increase the hour until the correct hour and pm is displayed.

11. In the time format menu, press Select and then press the up or down arrow button to change the format, 12 hr. or 24 hr. Press Select to save the displayed format.

12. Press the down arrow button. Return is displayed.

Press: Display:

```
<-- Return
```

13. Press Select to return to the Date and Time menu.

Press: Display:

```
Date      -->
and Time
```

14. Press the Up or Down arrow buttons to step to a different menu.

15. Press Auto to signal the controller to exit the menus and return to the generator set status display.

Press: AUTO Display:

```
Genset State
Standby
```

Note: If no buttons are pressed, the controller returns to the status display after 5 minutes.

Figure 3-7 Changing Settings

3.6 Setting the Exerciser

Set the exerciser to automatically run the generator set for 20 minutes every week or every two weeks.

3.6.1 Setting the Exerciser at Controller Power-up

When battery power is connected to the controller, you will be prompted to set the date and time, and then to set the exerciser.

The first setting will flash. Press the Up and Down arrow buttons to change the setting. Press Select to save the setting and move on to the next. See Section 3.5 for more detailed instructions to change settings on the VSC.

If the battery is disconnected and reconnected during generator set maintenance or service, the time, date, and exercise settings will need to be re-entered.

3.6.2 Changing the Exercise Settings

This section explains how to change the exercise settings after the initial setup.

Follow the procedure below and see the flowchart in Figure 3-8 to set the exercise time and date, mode, and frequency.

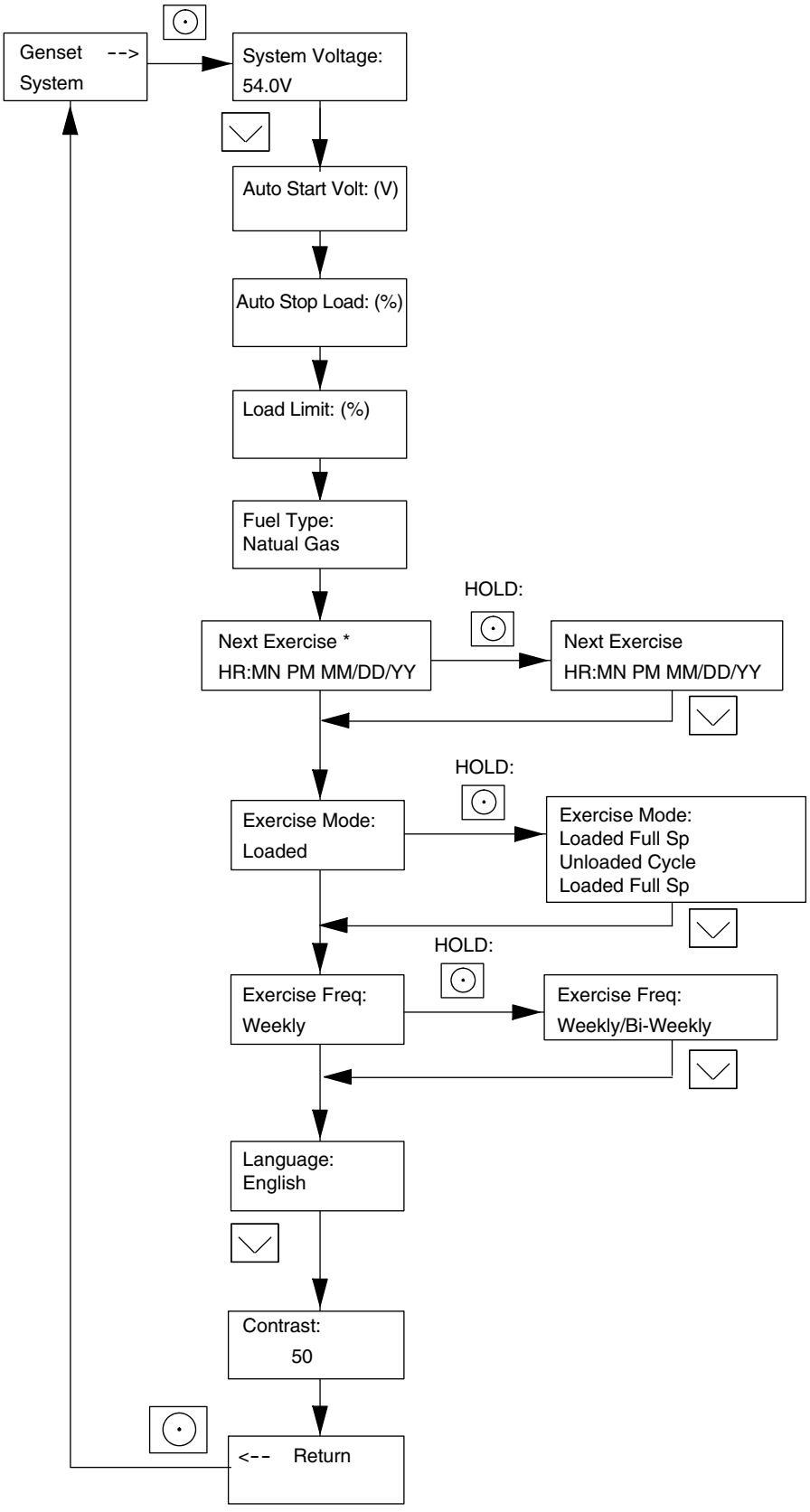
Procedure to Set the Exerciser

1. Press the AUTO button on the controller.
2. Press the Select button to go to the main menu. See Figure 3-9.
3. Press the down arrow button to step to the Genset System menu.
4. Press the Select button to enter the Genset system menu. See Figure 3-11.
5. Use the down arrow button to step to the Next Exercise menu. If the exerciser is not set, No Exercise Scheduled will be displayed.
6. Press and HOLD the Select button to enable editing.
7. Press the Select button. The setting flashes to show that it can be changed. For example, HR flashes to show that the hour can be changed.
8. Press the Up or Down arrow buttons to change the setting.
9. Press the Select button to save the setting and move to the next. For example, save HR setting and move to MN.
10. Repeat steps 5 through 9 to change the next item on the line until the desired settings are displayed.
11. Press Select to save after all settings have been selected. Settings will stop flashing.
12. Set the exercise frequency (weekly or every two weeks). Weekly exercises are recommended.
13. Press the down arrow button to step to the Return menu. Press the Select button to return to the main menu.

After a scheduled exercise run, the next exercise time and date will be updated automatically based on the Exercise Frequency setting.

Exerciser Reset

To reset the exerciser to run at a different day and/or time or to change the exercise mode, follow the procedure in Section 3.6.2 to change the exerciser settings.



* If the exerciser has not been set, No Exercise Sch will be displayed.

Figure 3-8 Procedure to Set the Exerciser on the VSC Controller

3.7 VSC Controller Menus

Controller menus display power system information, including status information for the engine, generator, and optional RBUS accessories, exercise settings, and event history. Some menus allow changes to the controller settings.

Diagrams in the following sections show how to navigate through the menus.

Note: Use caution when navigating the controller menus. In some menus, pressing the Select button can enable editing of the controller settings. Changing the settings to incorrect values can adversely affect generator set operation or render the unit inoperable.

If a setting on the controller display is flashing, edit mode has been enabled. Press the OFF or AUTO button to exit the edit mode.

3.8 Main Menu

Press the Select button once to bring up the main menu. Overview is displayed. See Figure 3-9. Press the down arrow button to step to the next menu, Engine Metering. Use the UP and DOWN arrow buttons to step up and down through the menus shown in Figure 3-9.

The controller will exit the main menu after 5 minutes if no buttons are pressed. To exit the main menu immediately, press the controller's OFF or AUTO button.

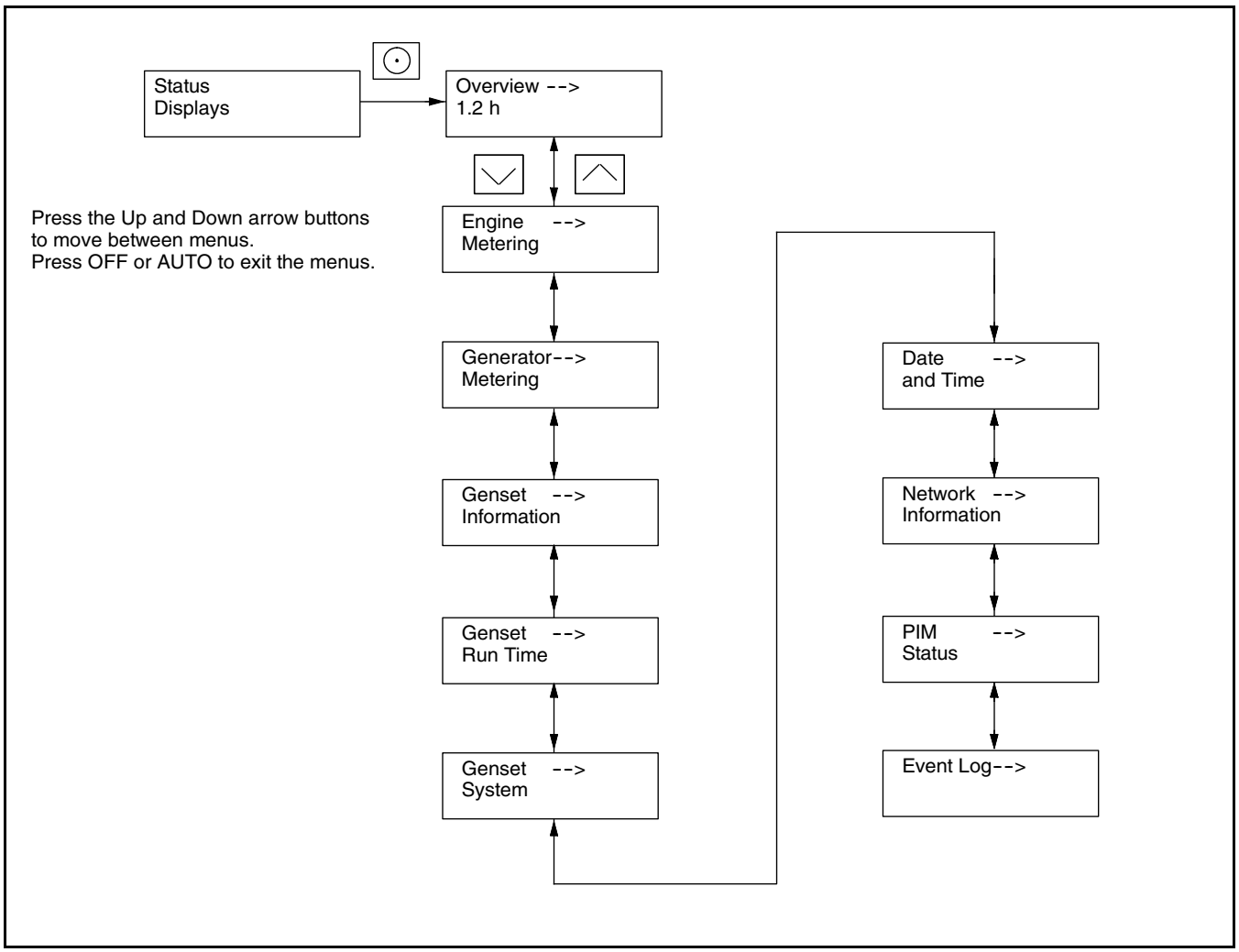


Figure 3-9 VSC Main Menu

3.9 Overview Menu

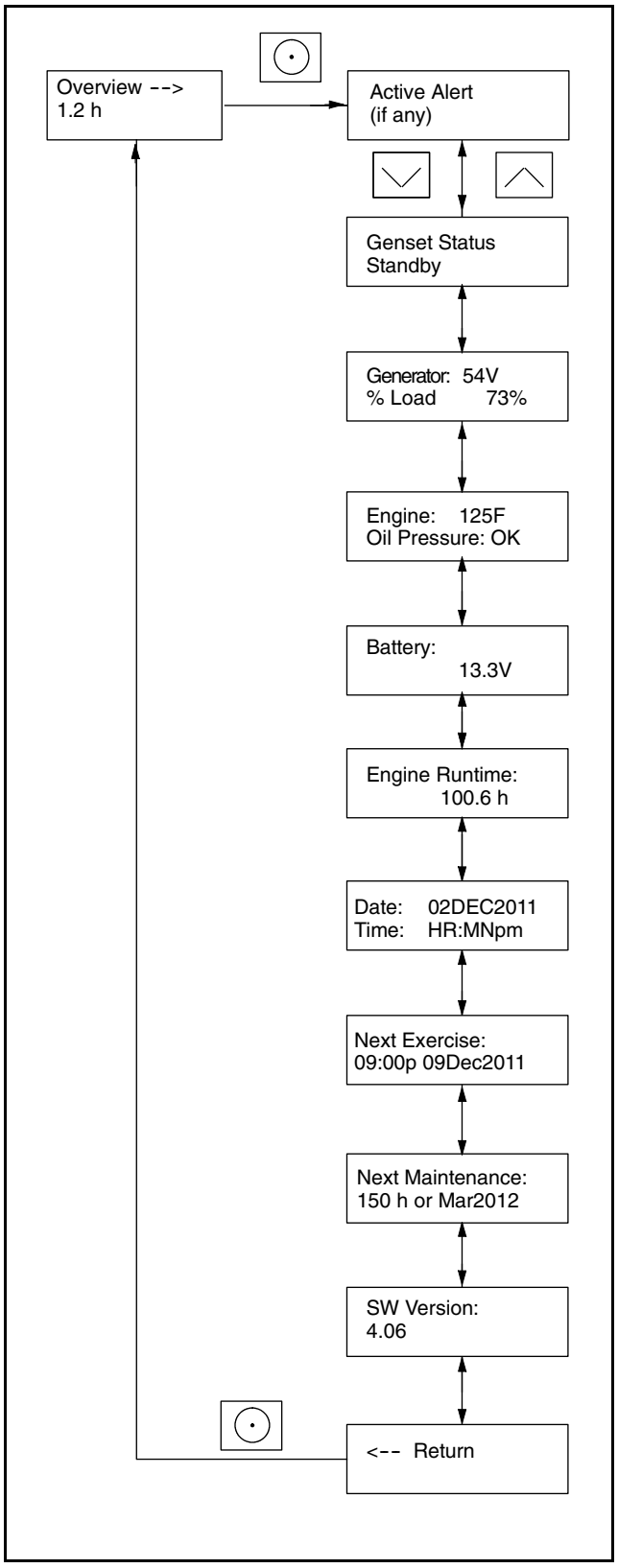


Figure 3-10 Overview Menu

3.10 Engine Metering Menu

The engine metering menu displays engine status information as shown in Figure 3-11. This menu displays status information only. No settings can be changed from this menu.

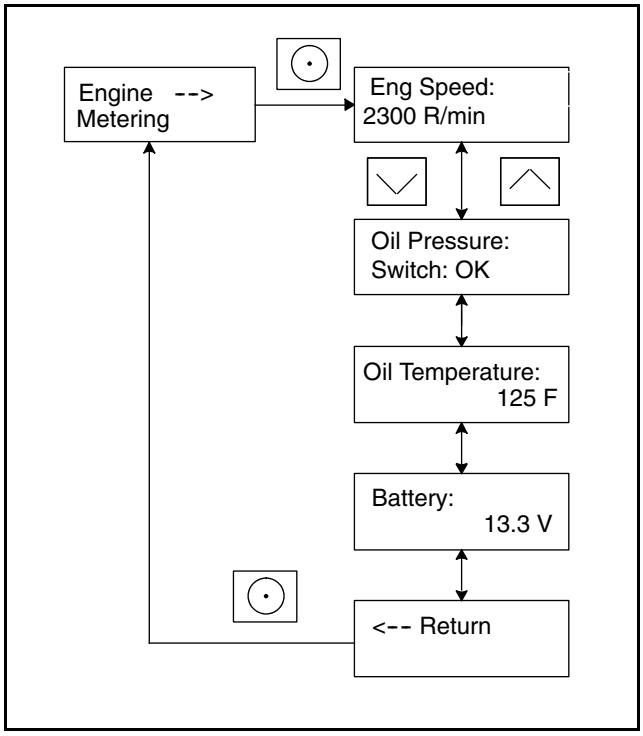


Figure 3-11 Engine Metering Menu

3.11 Generator Metering Menu

The generator metering menu displays the generator voltage and % load. See Figure 3-12.

3.11.1 Calibration

DANGER

Hazardous voltage.
Will cause severe injury or death.

This equipment must be installed and serviced by qualified electrical personnel.

The calibration mode can be entered from the Generator Metering menu. Contact a Kohler-authorized distributor/dealer for service.

The Reset Calibration menu allows you to set the readings back to the default settings after calibration, if necessary. See Figure 3-12.

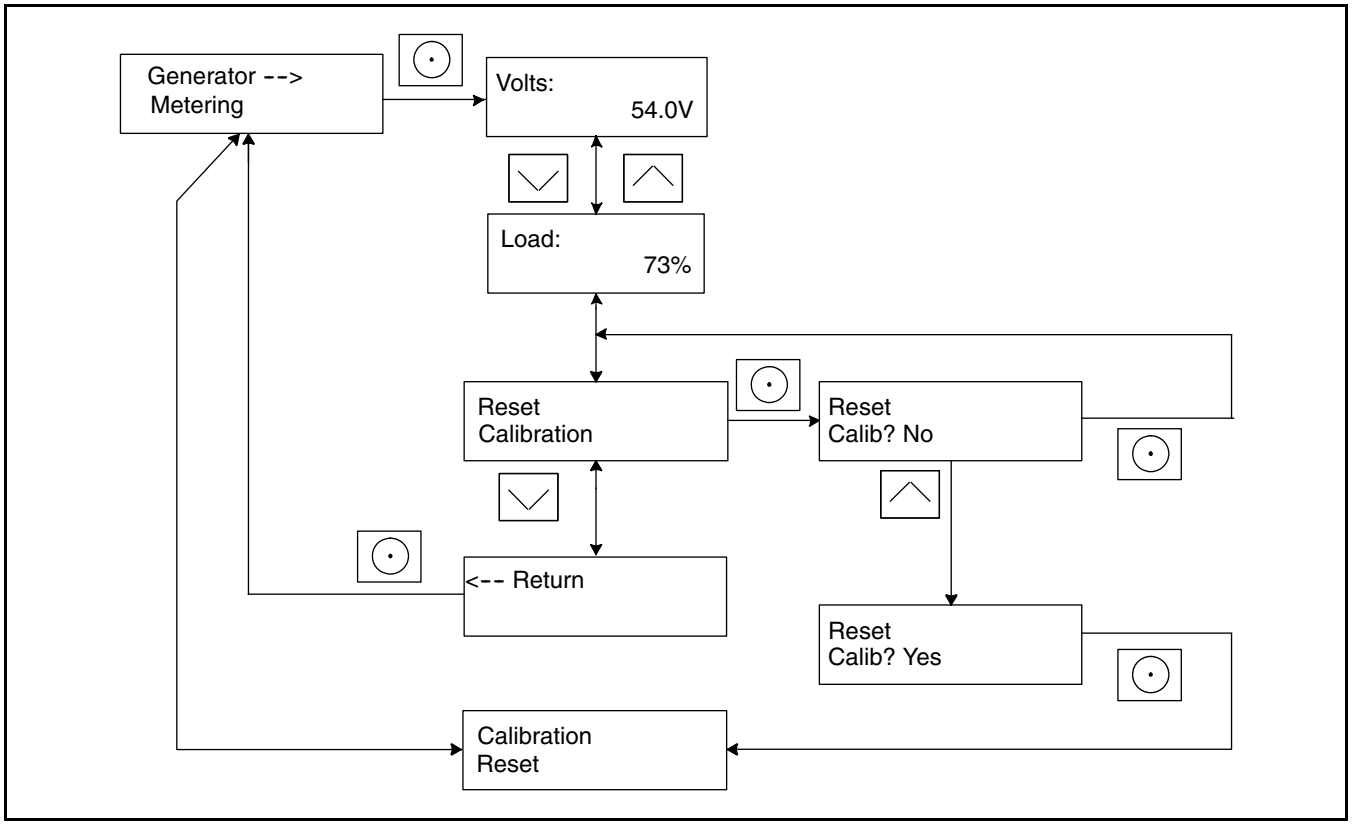


Figure 3-12 Generator Metering Menu

3.12 Generator Set Information Menu

The generator set model number and serial numbers are displayed (see Figure 3-13). No changes are allowed from this menu.

Model and serial numbers are factory-set and should not require changes in the field, except in the event that the controller is being replaced. A personal computer running Kohler® SiteTech™ software is required to enter the generator set model number and serial numbers on a replacement controller. Contact an authorized Kohler distributor/dealer for service.

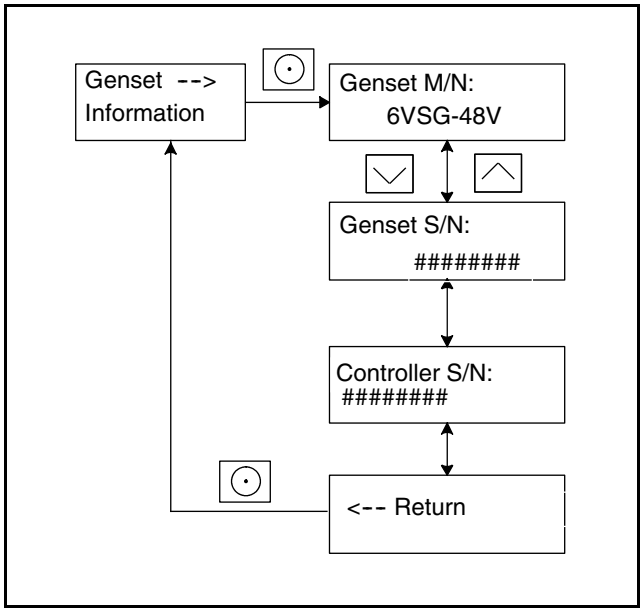


Figure 3-13 Generator Set Information Menu

3.13 Genset Run Time Menu

The data shown in Figure 3-14 are displayed. No changes are allowed from this menu.

The Next Maintenance menu shows the number of hours of generator set operation until maintenance is required. The estimated date for the next scheduled maintenance is also displayed. The maintenance reminder intervals are based on the engine manufacturer's recommendation for changing the oil. See Section 4, Scheduled Maintenance, for maintenance instructions.

After changing the oil and performing other recommended maintenance, go to the Overview menu to reset the maintenance timer. See Section 4.2.5 for instructions to reset the maintenance timer.

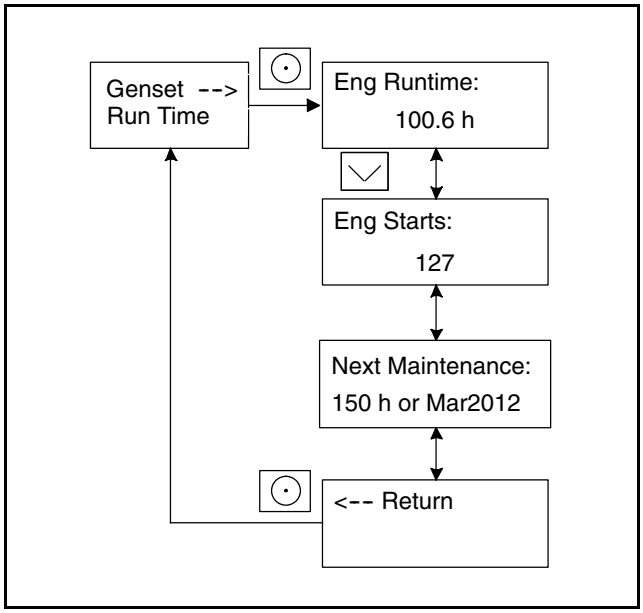


Figure 3-14 Generator Set Run Time Menu

3.14 Genset System Menu

The genset system menu displays the system information shown in Figure 3-19. Generator sets are factory-set and should not require changes to the system settings in the field.

A Kohler-authorized distributor or dealer can adjust these settings, if necessary. If the generator set is reconnected to a different voltage or the system settings require adjustment for some other reason, see Section 3.5 for instructions to enable editing and change the system settings.

Note: Use caution when navigating the controller menus. In some menus, pressing the Select button can enable editing of the controller settings. Changing the settings to incorrect values can adversely affect generator set operation or render the unit inoperable.

3.14.1 System Parameters for Battery Bank Charging

The following system parameters can be viewed in the Genset System menu on the user interface on the generator set's VSC controller.

- System Voltage
- Auto Start Voltage
- Auto Stop Load (%)
- Load Limit

Note: Changing these settings can damage your generator set and batteries. Always refer to the information provided by the battery bank manufacturer for the correct voltage and charge current limits for your batteries. Contact an authorized Kohler distributor or dealer for assistance if the default settings are not appropriate for the battery bank.

System Voltage: The system voltage is the output voltage of the generator set. Default values are shown in Figure 3-15. The system voltage is set to the required output voltage to properly support the load and charge the battery. Do not confuse this value with the voltage designation of the battery stack. For example, four 12V batteries in series results in a 48V battery stack, but the output voltage needed to charge the battery stack is 54V.

Nominal Voltage	24V	36V	48V
Default System Voltage, VDC	27	40.5	54

Figure 3-15 System Voltage Default Settings

Refer to the battery manufacturer's documentation for the recommended charging voltage. If the system voltage needs to be changed, contact an authorized Kohler distributor or dealer.

Note: Setting the system voltage to a higher value than the factory default setting will decrease the power output of the generator set.

A 6VSG set at the system voltage shown in Figure 3-15 will have an output of 6 kW. If the system voltage is set to a higher value, the output current decreases. The available power output also decreases below 6 kW due to the limits on the engine speed. The graphs in Figure 3-17 illustrate the effect of changing the system voltage.

Auto Start Volt: The 6VSG will automatically start when the battery bank voltage has reached or fallen below this value for 180 seconds (3 minutes). Default settings are shown in Figure 3-16.

Nominal Voltage	24V	36V	48V
Default Auto Start Voltage, VDC	25	37.5	50

Figure 3-16 Auto Start Voltage

Note: The 3-minute (180-second) time delay can be changed using a personal computer (laptop) and Kohler® SiteTech™ software. Contact a Kohler authorized distributor or dealer to adjust the delay setting, if necessary.

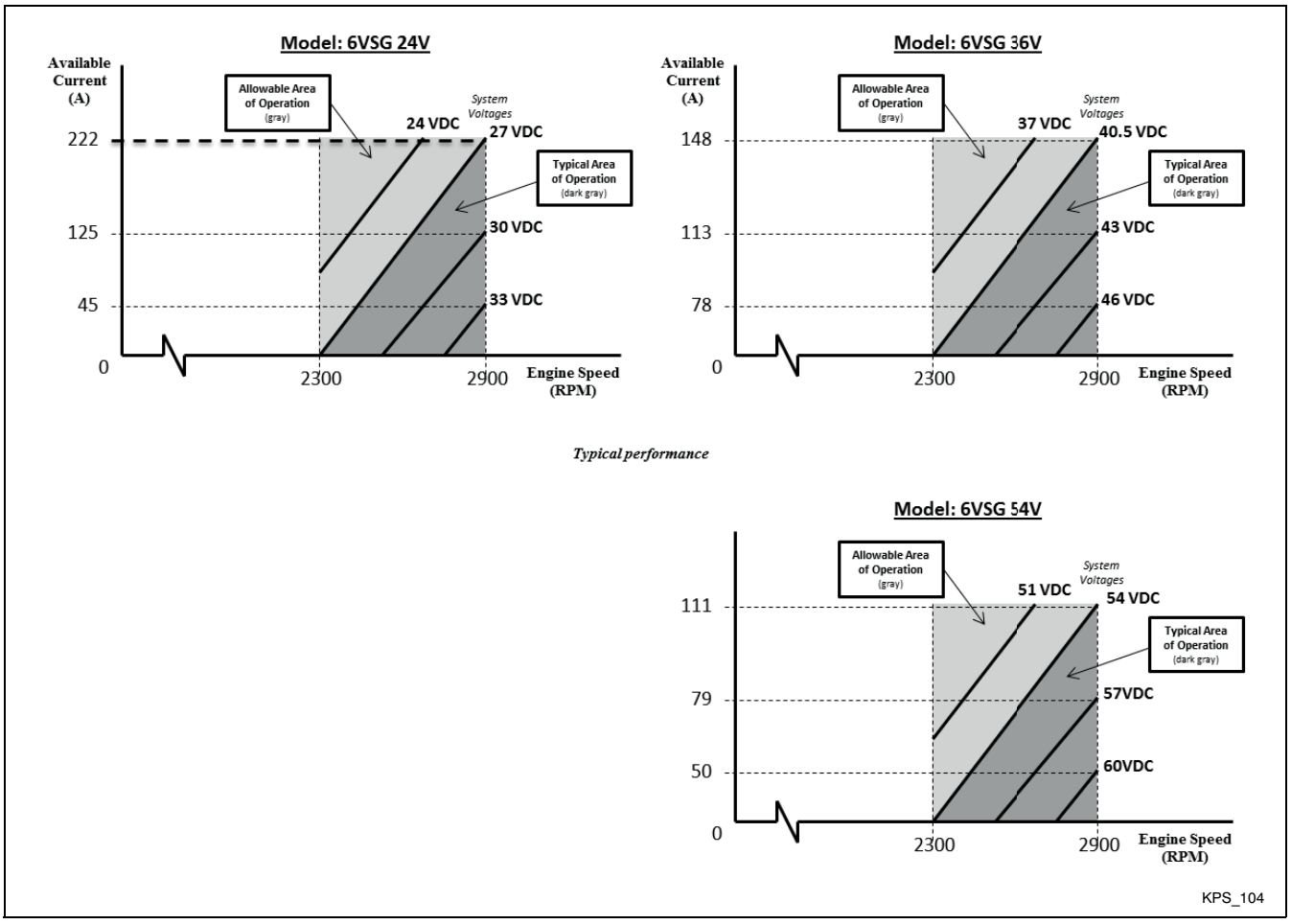


Figure 3-17 Effect of Changing the System Voltage Setting

Auto Stop Load: The auto stop load is set as a percentage of full load. As the battery bank approaches the fully charged state, the charge rate slows, and the load on the generator set decreases. The 6VSG will automatically stop when the load has reached or fallen below the Auto Stop Load setting for 180 seconds (3 minutes). The default setting is 40% load.

Load Limit (%): This setting limits the current output to the maximum charge rate specified by the battery manufacturer or load in the application. The default setting is 100%, which gives the maximum current values shown in Figure 3-18. Refer to the battery manufacturer's recommended maximum charge rate and contact an authorized Kohler distributor or dealer if the setting needs to be changed.

$$\text{Load Limit} = \frac{\text{(Recommended charging voltage (VDC) x Maximum charging current (amps)) x 100}}{\text{6000 watts}}$$

Nominal Voltage	24V	36V	48V
System Voltage, VDC	27	40.5	54
Maximum Current at 100% Load Limit, Amps	222	148	111

Figure 3-18 Maximum Charge Current at Default Load Limit Setting of 100%

3.14.2 Setting the Exerciser

Use the Genset System menus to set the generator set exerciser. See Section 2.5 for instructions to set the exerciser and for more information about exercising the generator set.

After a scheduled exercise run, the Next Exercise time and date will be updated automatically based on the Exercise Frequency setting.

3.14.3 Adjusting the Display Contrast

To adjust the display contrast, use the down arrow button to step to the Contrast menu. Press the Select button, and then use the up and down arrow buttons to adjust the contrast. Press the Select button to save the contrast setting.

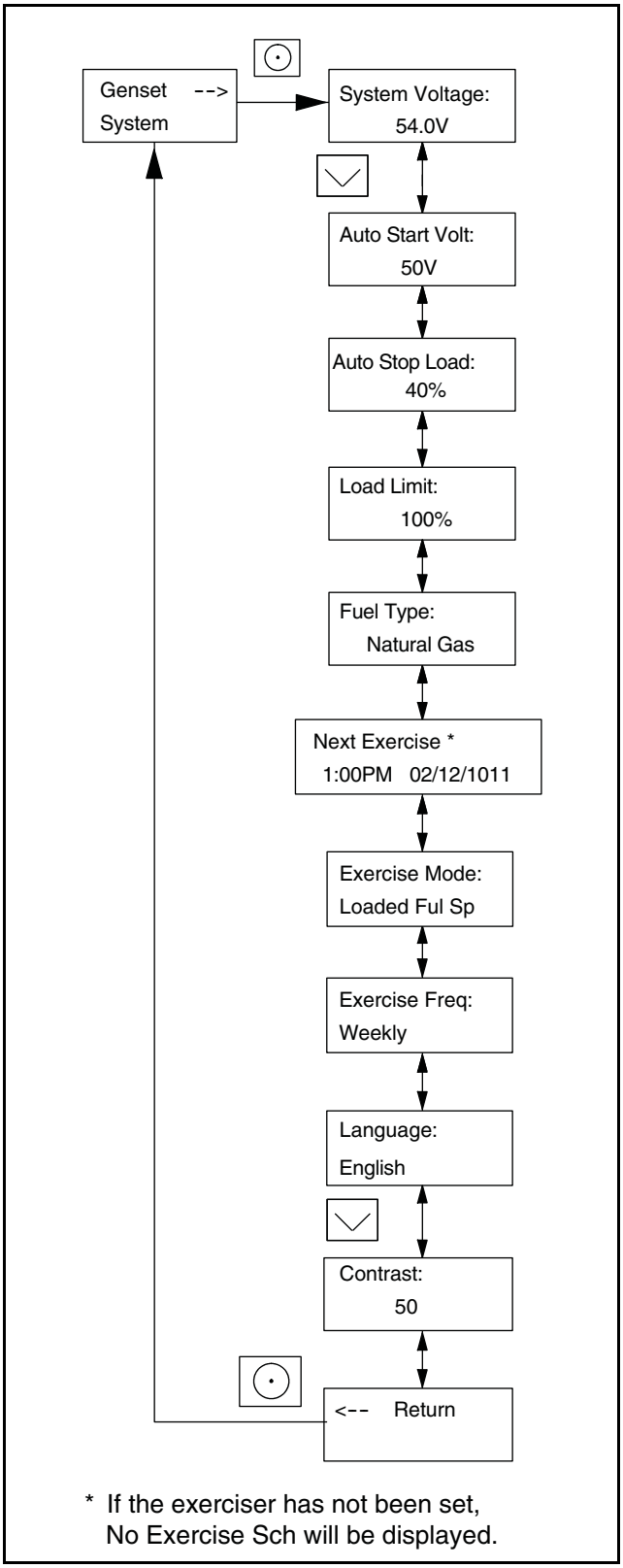


Figure 3-19 Genset System Menu

3.15 Date and Time Menu

The date and time will typically be set at controller powerup. To change the date, time, or time format (12 hour or 24 hour), use the Date and Time menu. See Figure 3-20.

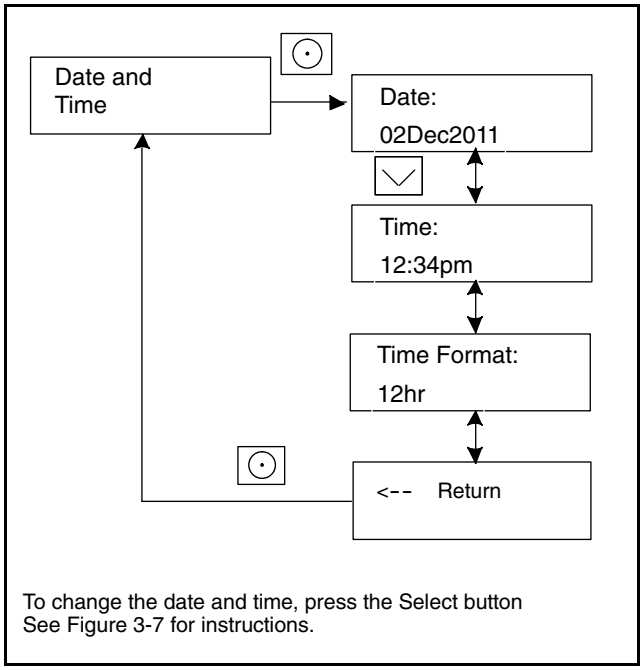


Figure 3-20 Date and Time Menu

3.16 Networking Information Menus

Use the networking menus to view and adjust communication settings for systems with remote RBUS devices such as a PIM, and for systems that use the Kohler® OnCue® Generator Management System.

RBUS is a proprietary RS-485 communications protocol.

The Networking Information menu leads to submenus for network and RBUS communication settings. See Figure 3-21.

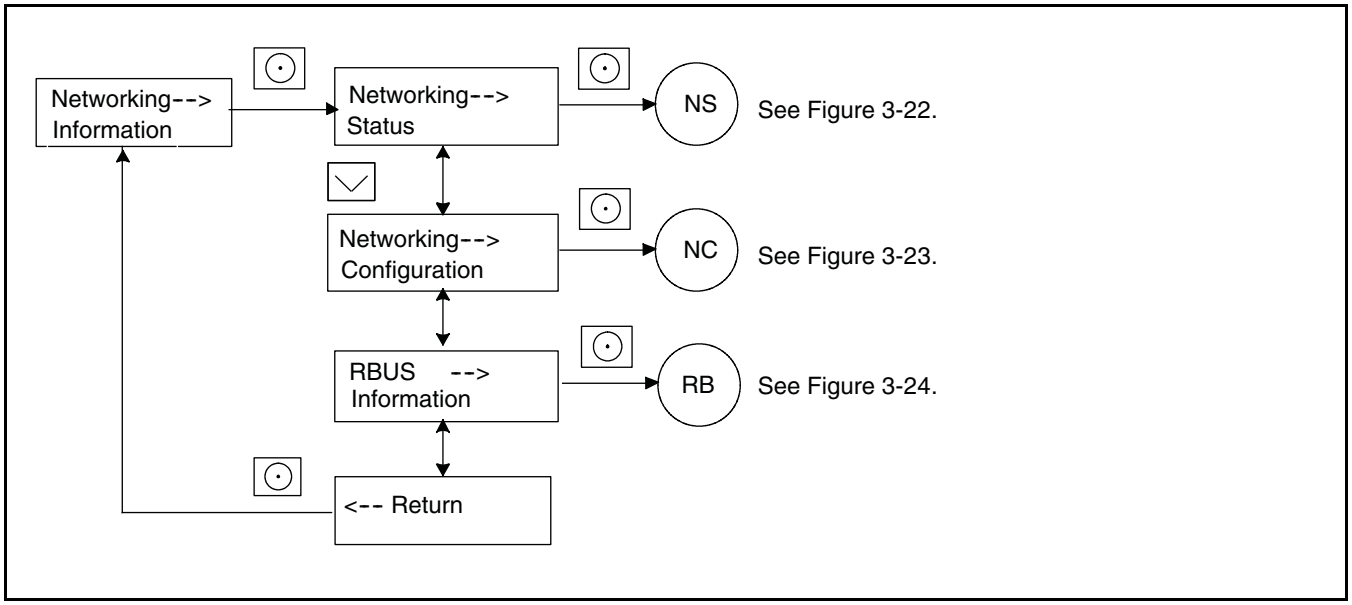


Figure 3-21 Networking Information Menu

3.16.1 Networking Status Submenu

The Networking Status submenu contains settings for OnCue®. See Figure 3-22. See the OnCue® Software Operation Manual for information about the appropriate network settings for OnCue®. Changes to these settings are not typically required.

If DHCP is enabled, IP parameters are not displayed. If DHCP is disabled (i.e., if a static IP address is used), the IP parameters are displayed.

To enable or disable DHCP and change the IP settings, go to the Networking Configuration menu. See Section 3.16.2.

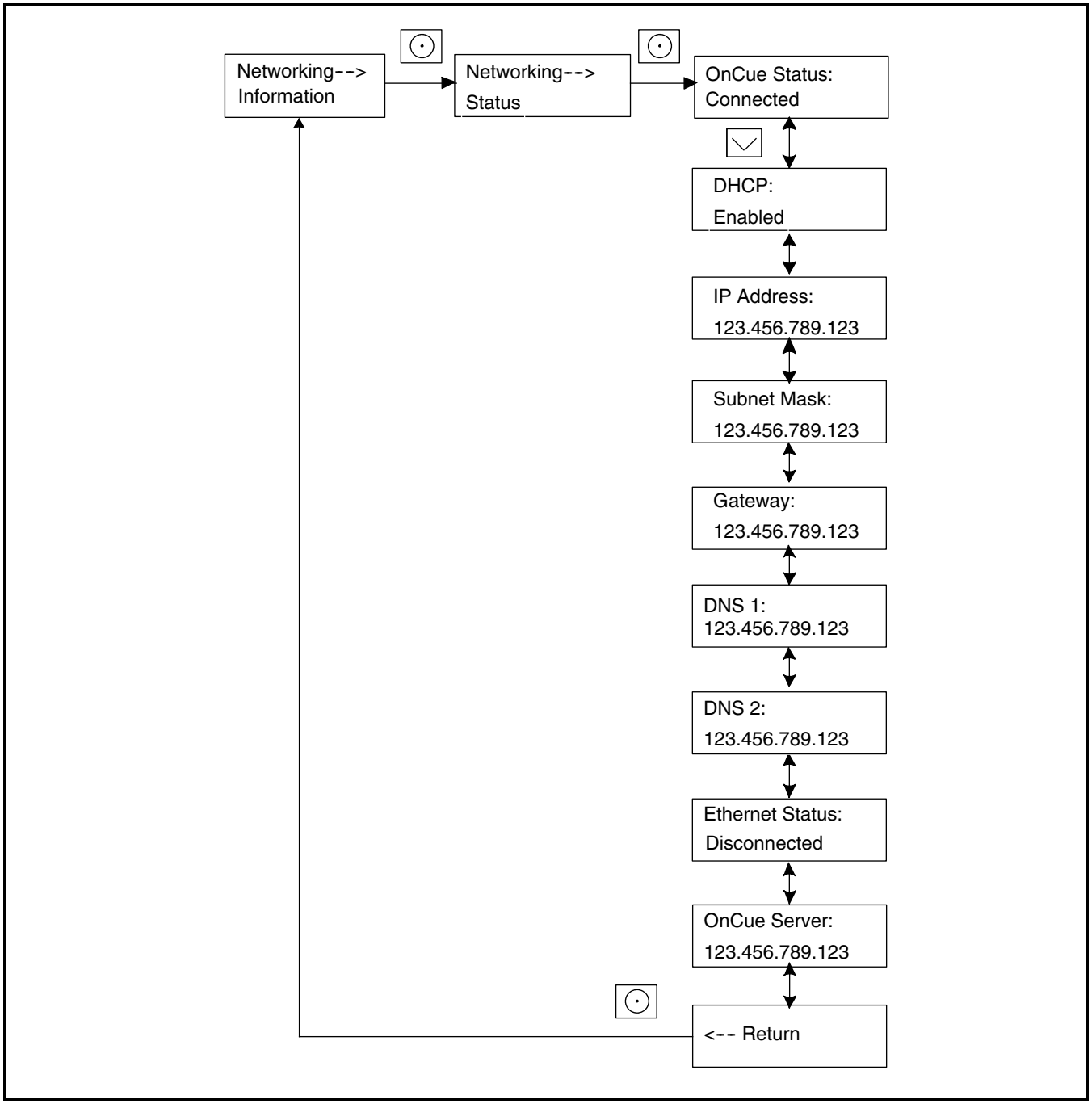


Figure 3-22 Network Status Submenu

3.16.2 Networking Configuration Submenu (OnCue® Password)

The networking Configuration menu includes settings used for communication with the Kohler® OnCue® Generator Management System. See Figure 3-24.

For most applications, DHCP is enabled and the IP settings cannot be changed from the controller keypad. If DHCP is enabled, IP parameters are not displayed.

If DHCP is disabled (i.e., if a static IP address is required), then the IP parameters can be modified. For applications that require static IP addresses, press and hold the select button to enable editing, disable DHCP, and then step to the next parameters and enter the information.

If an error occurs while setting a parameter, an error message is displayed and then the controller exits the edit mode. Previous settings are preserved.

Password

For the initial OnCue® setup, you will be required to reset the OnCue® password on the VSC controller, and then enter it into the OnCue® software. To reset the password, follow the instructions in Figure 3-22.

Note: The password is displayed for only 10 seconds. Be sure to write down the password and serial number.

A new password is generated each time the reset password procedure is performed. If the password is reset after the OnCue® system has been set up, the connection will be lost. Enter the new password in OnCue® to reconnect.

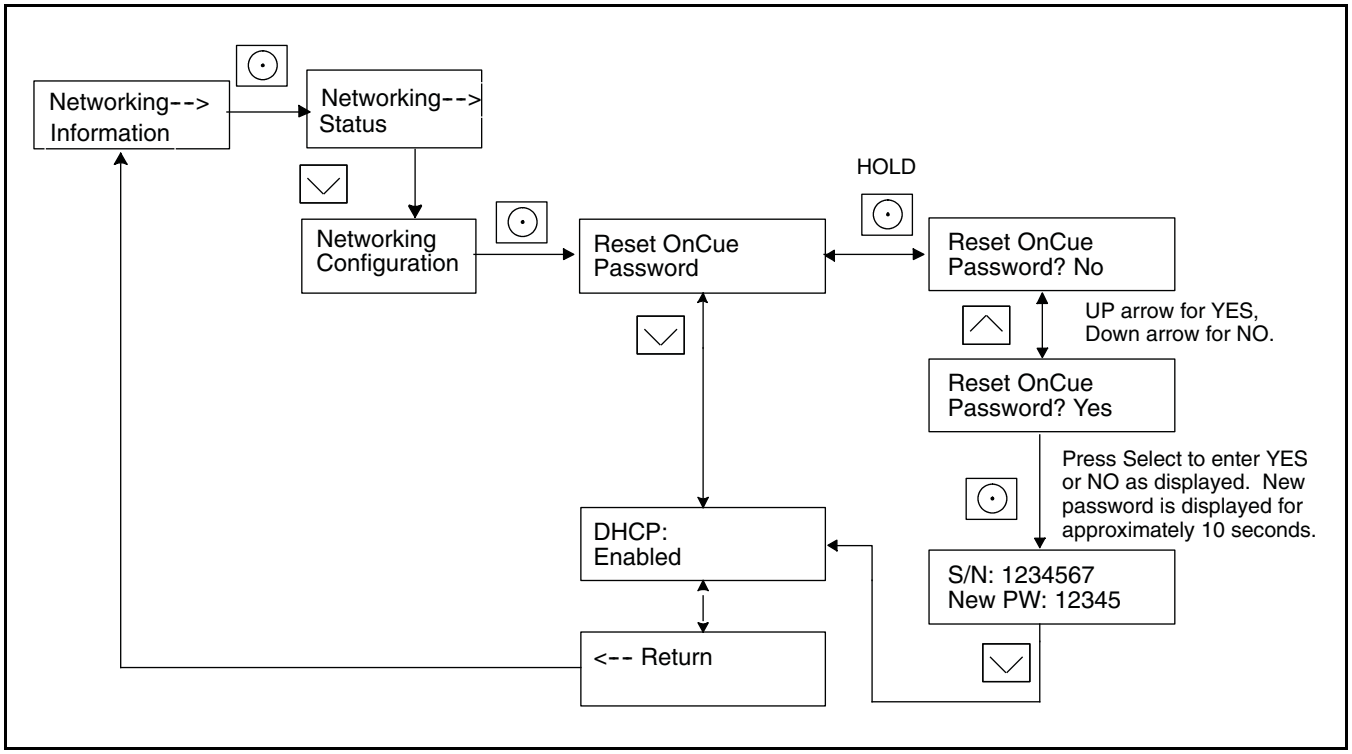

Networking--> Information
Networking--> Status
Networking Configuration
Reset OnCue Password
HOLD
Reset OnCue Password? No
UP arrow for YES, Down arrow for NO.
Reset OnCue Password? Yes
Press Select to enter YES or NO as displayed. New password is displayed for approximately 10 seconds.
S/N: 1234567 New PW: 12345
DHCP: Enabled
<-- Return

Figure 3-23 Network Configuration Submenu

3.16.3 RBUS Information

The RBUS Information menu contains settings for remote modules that communicate with the VSC controller using RBUS protocol (see Figure 3-24). This includes the following optional modules:

Programmable Interface Module (PIM)

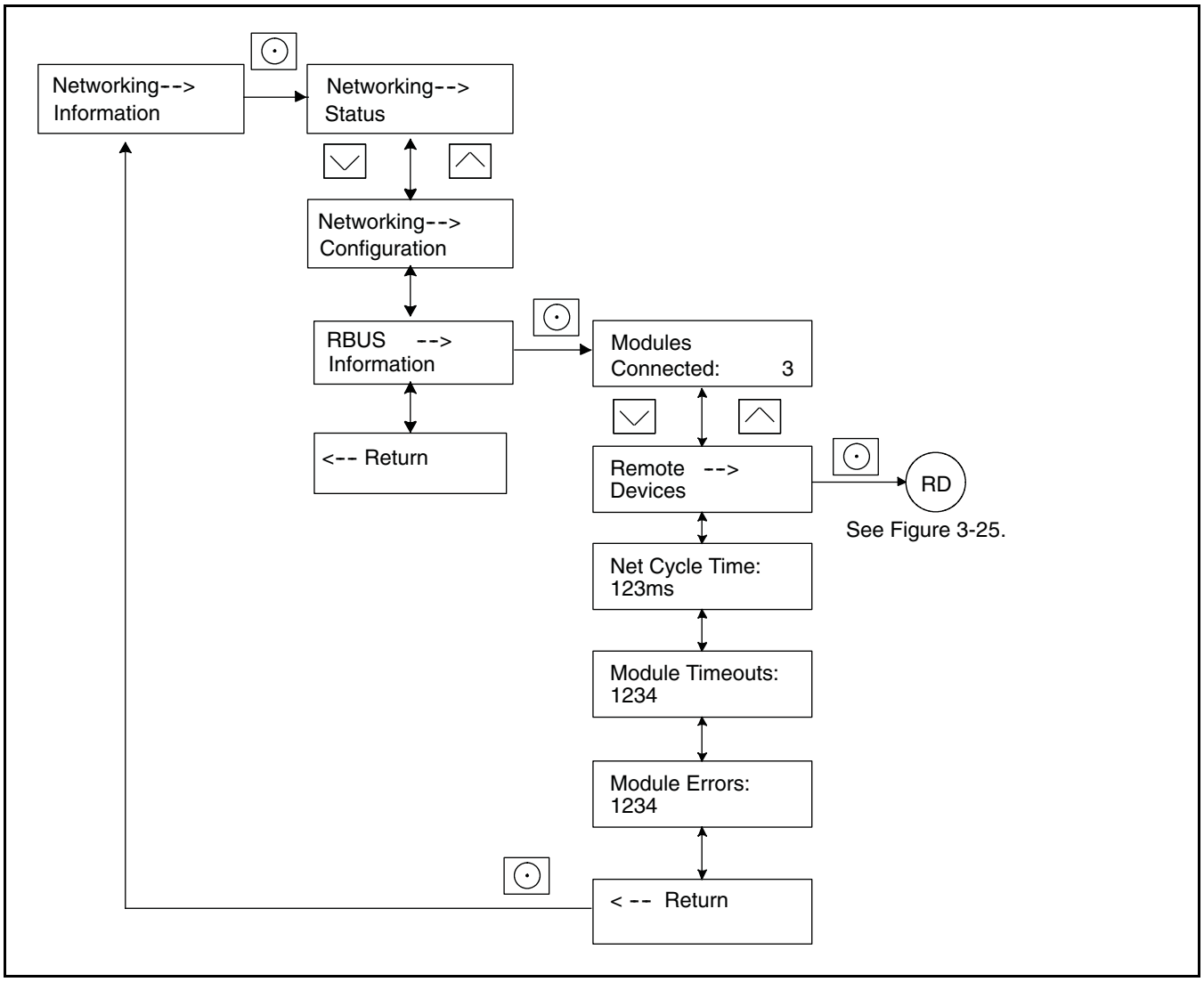


Figure 3-24 VSC Information Submenu

3.16.4 Remote Devices Submenu

Check the status of remote devices communicating through RBUS (see Figure 3-25). Device types can include:

Programmable Interface Module (PIM)

The serial numbers for the PIM are printed on the circuit boards inside the enclosures.

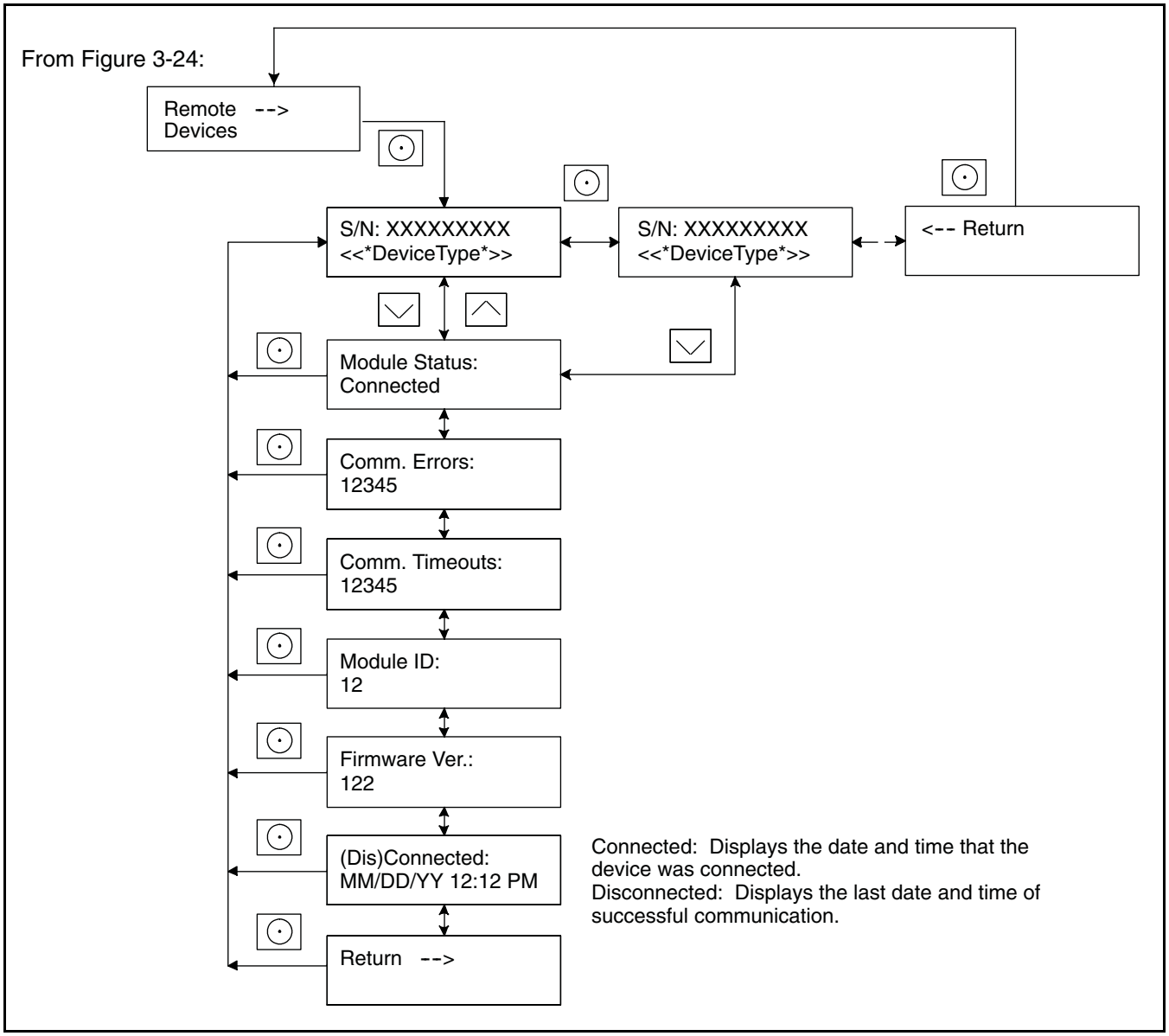


Figure 3-25 Remote Devices Submenu

3.17 Programmable Interface Module (PIM) Status Menu

Note: The PIM status menu appears if a programmable interface module (PIM) or a communications kit interface board (IB) is connected.

The PIM status menu displays the status of inputs and outputs connected to the programmable interface module (PIM) or communications kit interface board (IB). See Figure 3-26. This is a status display menu only. Input and output settings cannot be changed from the VSC controller's user interface.

A personal computer running Kohler® SiteTech™ software is required to change the input and output settings for the PIM. Contact an authorized distributor or dealer for service.

The Kohler® OnCue® Management System can be used to turn the PIM outputs on and off. See the OnCue® Software Operation Manual for instructions.

The input and output settings for the communications kit interface board are factory set and locked.

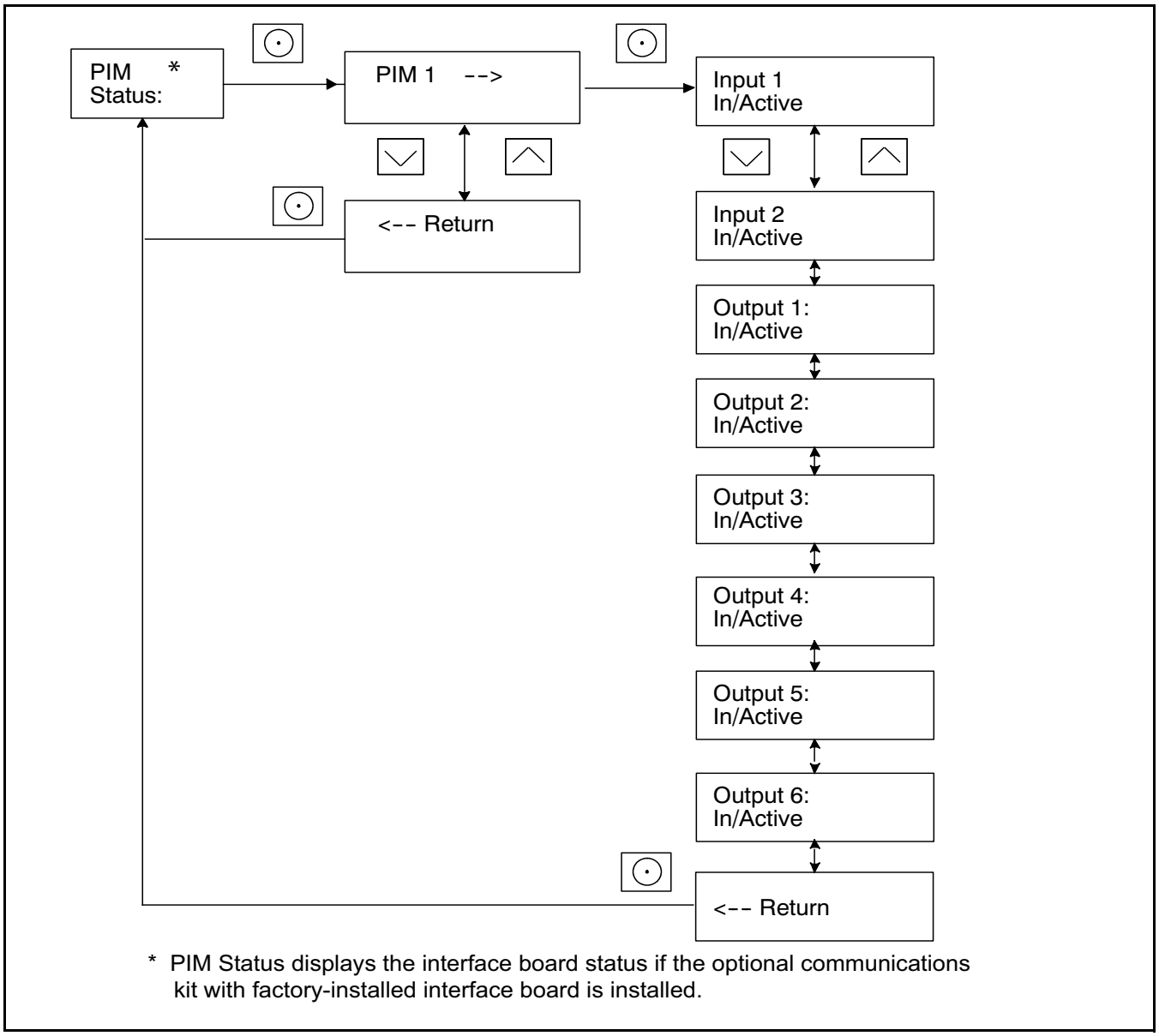

PIM * Status:
PIM 1 -->
<-- Return
Input 1 In/Active
Input 2 In/Active
Output 1: In/Active
Output 2: In/Active
Output 3: In/Active
Output 4: In/Active
Output 5: In/Active
Output 6: In/Active
<-- Return
* PIM Status displays the interface board status if the optional communications kit with factory-installed interface board is installed.

Figure 3-26 Programmable Interface Module (PIM) Status Menu

3.18 Event Log

The event log displays up to 1000 controller faults and notices, starting with the most recent event. Events are numbered 1-1000, with 1 being the most recent. Each event is displayed with the date and time of the event, the number of the event, a code to indicate whether the event was a warning (W), shutdown (S), or informational notice (I), the engine hours at the time of the event, and the event description. See Figure 3-27.

3.18.1 Procedure to View Event History

1. Press Select to enter the main menu.
2. Press the down arrow to step down to the event log.
3. Press Select to display the most recent event.
4. Press the down arrow to step to the next event.
5. Use the up and down arrow buttons to view events.
6. Press the Select button to exit the event log.

To stop viewing the event history before the last event, press the select button to return to the main menu.

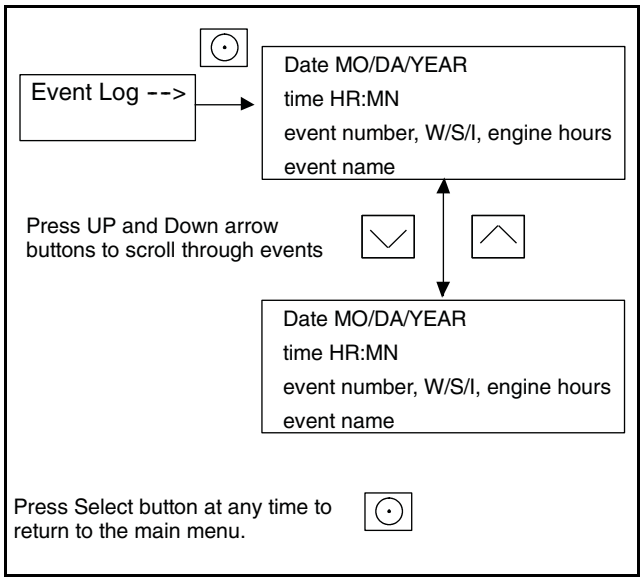
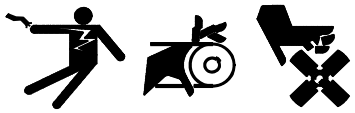

Event Log -->
Date MO/DA/YEAR
time HR:MN
event number, W/S/I, engine hours
event name
Press UP and Down arrow buttons to scroll through events
Date MO/DA/YEAR
time HR:MN
event number, W/S/I, engine hours
event name
Press Select button at any time to return to the main menu.

Figure 3-27 Event Log

Notes

WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Press the generator set OFF/RESET button to shut down the generator set. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

WARNING

Hazardous voltage. Moving parts.
Can cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

WARNING

Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

4.1 Scheduled Maintenance

Refer to the following service schedules and the runtime hours displayed on the controller display to schedule routine maintenance. Intervals are shown in hours of operation and/or time intervals (i.e. weekly, monthly, quarterly, etc.) Have an authorized distributor/dealer service the generator set at the designated intervals in the service schedule for the life of the generator set. Service units subject to extreme weather, long operating hours, or dusty or dirty conditions more frequently.

Contact an authorized distributor/dealer for parts.

4.1.1 Service Schedule, 6VSG Models

System Component or Procedure	See Section	Procedure					Frequency
		Visually Inspect	Check	Change	Clean	Test	
Fuel							
Flexible lines and connections		X		R			Quarterly
Main tank supply level (if LPG fueled)			X				Weekly
Fuel piping		X					Yearly
Lubrication	4.2						
Oil level		X	X				8 hours or before use
Crankcase breather hose		X					Yearly or 500 hours
Change oil				X			Yearly or 100 hours ‡
Replace filter				X			Yearly or 200 hours
Cooling	4.5						
Air ducts, louvers			X		X		Yearly
Exhaust Line	4.6						
Leakage		X	X				Weekly
Insulation, fire hazards		X					Yearly
Obstructions or combustible materials near exhaust outlet		X					Weekly
DC Electrical System	4.7						
Battery charger operation, charge rate (if equipped)		X					Monthly
Remove corrosion, clean and dry battery and rack		X			X		Yearly
Clean and tighten battery terminals and inspect boots		X	X				Yearly
Battery electrolyte level and specific gravity *			X				Yearly
AC Electrical System							
Tighten control and power wiring connections			X				Yearly
Remote control system (if equipped)						X	Monthly
Visible wear or damage		X					Quarterly
Wire abrasions where subject to motion		X	X				6 months
Wire-cable insulation condition		X					3 years or 500 hours
Engine and Mounting							
Visible wear or damage		X					Weekly
Air cleaner and precleaner service †	4.4			R			Yearly or 100 hours
Spark plugs	4.3			X			Yearly or 300 hours
Replace stepper motor coupling and bushing				D			500 hours
Generator							
Visible wear or damage		X					Quarterly
Exercise generator set						X	Weekly
Brushes and collector ring		D			D		Yearly
Measure and record resistance readings of windings with insulation tester (Megger®, with SCR assembly or rectifier and load leads disconnected) *						D	3 years
General Condition of Equipment							
Evidence of vibration, leakage, excessive noise, temperature, or deterioration		X	X		X		Weekly
Interior of sound enclosure		X			X		Quarterly

* Not necessary for maintenance-free batteries.

† Service more frequently under extremely dusty/dirty conditions.

‡ Yearly or 250 hours if equipped with optional Oil Makeup Kit.

Megger® is a registered trademark of Biddle Instruments.

X Action

D Authorized distributor/dealer only

R Replace as necessary

4.2 Lubrication System

See the service schedules in Section 4.1 for oil change and oil filter replacement intervals. See the service views in Section 1.7 for the oil drain, oil dipstick, oil fill, and oil filter locations.

4.2.1 Low Oil Pressure Shutdown

The low oil pressure (LOP) shutdown feature protects the engine against internal damage if the oil pressure drops below a minimum pressure because of oil pump failure or other malfunction.

Note: The LOP shutdown feature does not protect against damage caused by operating when the oil level is low; it is not a low oil level shutdown. Check the oil level regularly, and add oil as needed.

4.2.2 Oil Check

The generator set is shipped with oil. Before operating the generator set, check the engine oil in the crankcase. See Figure 4-1.

Maintain the oil level at or near, not over, the full mark on the dipstick. Add 5W-30 synthetic oil when the oil level is low.

Check the oil level before each use. For extended operation, check the oil level every 8 hours. Do not check the oil level when the generator set is running. Shut down the generator set and wait several minutes before checking the oil.

Figure 4-1 Oil Check (typical)

4.2.3 Engine Oil Recommendation

Use 5W-30 API (American Petroleum Institute) Service Class SG, SH, or SJ synthetic oil. Synthetic oil oxidizes and thickens less than other oils and leaves the engine intake valves and pistons cleaner.

4.2.4 Oil Change Procedure

Note: Dispose of all waste materials (engine oil, fuel, filter, etc.) in an environmentally safe manner.

Drain the oil while it is still warm.

1. **Drain the oil.**
   a. Press the OFF button on the generator set controller.
   b. Disconnect the AC power to the generator set.
   c. Disconnect the generator set engine starting battery, negative (–) lead first.
   d. Open the housing service door and remove roof panel.
   e. Clean the area around the dipstick and oil fill cap.
   f. Remove the screw in plug on drain fitting in skid rail.
   g. Open the oil drain valve on the engine.
   h. Remove the dipstick and oil fill cap. Allow time for the engine oil to drain completely.
   i. Close the oil drain valve. Replace the cap in skid rail.
   j. Replace the dipstick.
2. **Replace the oil filter.**
   a. Clean the area around the oil filter. Remove the oil filter by rotating it counterclockwise with an oil filter wrench.
   b. Clean the gasket sealing surface of the oil filter adapter.
   c. Apply a light coat of clean oil to the rubber seal of the new oil filter.
   d. Install the new oil filter following the instructions provided with the filter.

3. **Fill with oil.**

   a. Fill the engine to the F mark on the dipstick. The engine oil capacity is shown in Figure 4-2. See Section 4.2.3 Engine Oil Recommendation, for oil selection.

Generator Set Model	Oil Capacity, L (qt.)
6VSG	1.9 (2.0)

Figure 4-2 Engine Oil Capacity

   b. Reinstall the dipstick and the oil fill cap.

   c. Reconnect the generator set engine starting battery, negative (–) lead last.

   d. Reconnect the AC power to the generator set.

   e. Press the RUN button on the generator set controller. The generator set will start.

   f. Run the generator set for a minute to allow the oil pressure to reach operating range.

   g. Stop the generator set, wait 1 minute, and then recheck the oil level. Add oil to bring the level up to the F mark on the dipstick.

4. **Check for leaks.**

   a. Check for oil leaks.

   b. Fix leaks and recheck the oil level.

   c. Reinstall the roof panel and close service door.

5. **Reset the maintenance timer on the controller.**

4.2.5 Resetting the Maintenance Timer

1. In the Overview menu, step down to the Next Maintenance screen.
2. Press the Select button.
3. Press the Up arrow button so that Reset Maint Timer? Yes is displayed.
4. Press the Select button. After about two minutes, the new maintenance interval and date are displayed.

4.3 Spark Plugs

Reset the spark plug gap or replace the plugs with new plugs as necessary.

1. Clean the area around the base of the spark plug to keep dirt and debris out of the engine.
2. Remove the spark plug and check its condition. Replace the spark plug if it is worn or if its reuse is questionable.
3. Check the spark plug gap using a wire feeler gauge. See Figure 4-3 for the recommended spark plug gap. Adjust the gap by carefully bending the ground electrode. See Figure 4-4 and Figure 4-5.
4. Reinstall the spark plug into the cylinder head. Torque the spark plug to 24.4-29.8 Nm (18-22 ft. lb.)

Generator Set Model	Spark Plug Gap
6VSG	0.76 mm (0.030 in.)

Figure 4-3 Spark Plug Gap

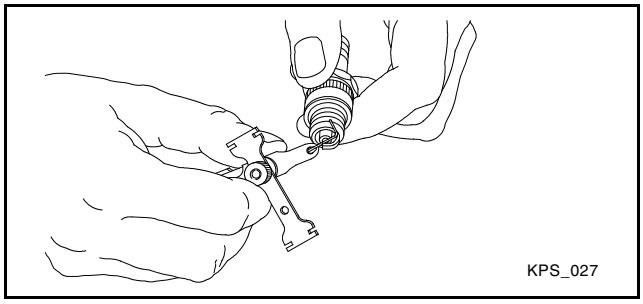


Figure 4-4 Checking the Spark Plug Gap

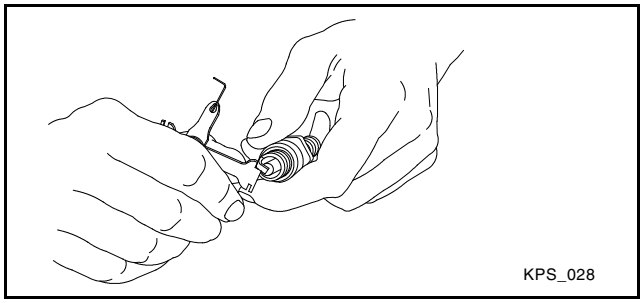
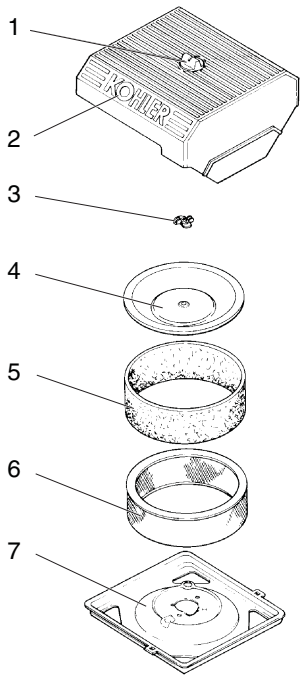


Figure 4-5 Adjusting the Spark Plug Gap

4.4 Air Cleaner Service

The engine has a replaceable high-density paper air cleaner element with an oiled foam precleaner. See Figure 4-6.



1. Cover knob
2. Air cleaner cover
3. Element cover nut
4. Element cover
5. Foam precleaner
6. Air cleaner element
7. Air cleaner base

Figure 4-6 Air Cleaner Components

Check for a buildup of dirt and debris around the air cleaner system. Keep this area clean. Also check for loose or damaged components. Replace all bent or damaged air cleaner components.

Note: Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

Precleaner Service

Use the following procedure to wash and oil the precleaner as indicated in the service schedule. Wash and oil the precleaner more often under extremely dusty or dirty conditions.

1. Press the OFF button on the generator set controller.
2. Disconnect the AC power to the generator set.
3. Disconnect the engine starting battery, negative (–) lead first.
4. Loosen the cover knob and remove the air cleaner cover. Remove the precleaner from the paper element. Wash the precleaner in warm water with detergent. Rinse the precleaner thoroughly until all traces of detergent are eliminated. Squeeze out excess water (do not wring). Allow the precleaner to air dry.
5. Saturate the precleaner with new engine oil. Squeeze out all of the excess oil.
6. Reinstall the precleaner over the paper element.
7. Reinstall the air cleaner cover. Secure the cover with the cover knob.
8. Reconnect the power to the battery charger.
9. Reconnect the generator set engine starting battery, negative (–) lead last.

Paper Element Service

Use the following procedure to replace the paper element at the intervals specified in the service schedule. Replace the paper element more often under extremely dusty or dirty conditions.

1. Press the OFF button on the generator set controller.
2. Disconnect the AC power to the generator set.
3. Disconnect the generator set engine starting battery, negative (–) lead first.
4. Loosen the cover knob and remove the cover.
5. Remove the element cover nut, element cover, and the paper element with precleaner.
6. Remove the precleaner from the paper element.

   Note: Do not wash the paper element or clean it with pressurized air, as this will damage the element.

7. Replace the element if it is dirty, bent, or damaged.

8. Check the air cleaner base. Make sure it is secure and not bent or damaged. Also check the element cover for damage and fit. Replace all damaged air cleaner components. Remove any loose dirt or debris from the air cleaner base. Wipe the base carefully so that no dirt drops into the intake throat. Check the condition of the rubber seal on the air cleaner stud and replace the seal if necessary.

9. Reinstall the paper element, precleaner, element cover, element cover nut, and the air cleaner cover. Secure the cover with the cover knob.

10. Reconnect the AC power to the generator set.

11. Reconnect the generator set engine starting battery, negative (–) lead last.

4.5 Cooling System

The engine fan draws cooling air through the openings in the sides. The alternator fan draws cooling air through an opening on the side wall of the enclosure. The cooling air mixes with the engine exhaust and is discharged at the exhaust outlet. See the service view in Section 1.7 for air intake and exhaust locations. To prevent generator set damage caused by overheating, keep the housing cooling inlets and outlets clean and unobstructed at all times.

Note: Do not block the generator set cooling air inlets or mount other equipment above them. Overheating and severe generator damage may occur.

4.6 Exhaust System

Remove all combustible materials from the exhaust location. Combustible materials include building materials as well as natural surroundings. Keep dry field grass, foliage, and combustible landscaping material a minimum of 1.5 m (5 ft.) from the exhaust outlet.

Periodically inspect the exhaust system components for cracks, leaks, and corrosion.

- Check for corroded or broken metal parts and replace them as needed.
- Check that the exhaust outlet is clear.

4.7 Engine Starting Battery

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death. Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

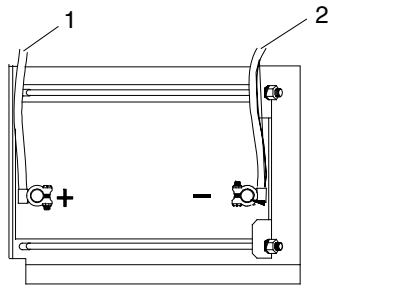
Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery. Never connect the negative (–) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

Refer to this section for general battery information and maintenance. Also consult the battery manufacturer's instructions for battery maintenance.

All generator set models use a negative ground with a 12-volt engine electrical system. Consult the generator set nameplate for the engine electrical system voltage. Consult the generator spec sheet for battery capacity recommendations for replacement purposes. Wiring diagrams provide battery connection information. See Figure 4-7 for typical battery connections.



1. To positive (+) terminal on starter solenoid
2. To ground (–) terminal on or near starter motor

Figure 4-7 12-Volt Engine Electrical System Single Starter Motor, Typical Battery Connection

Clean the battery and cables and tighten battery terminals using the service schedule recommendations. To prevent corrosion, maintain tight, dry electrical connections at the battery terminals. To remove corrosion from battery terminals, disconnect the cables from the battery and scrub the terminals with a wire brush. Clean the battery and cables with a solution of baking soda and water. After cleaning, flush the battery and cables with clean water and wipe them with a dry, lint-free cloth.

After reconnecting the battery cables, coat the battery terminals with petroleum jelly, silicone grease, or other nonconductive grease.

4.8 Storage Procedure

Perform the following storage procedure before removing the generator set from service for three months or longer. Follow the engine manufacturer's recommendations for storage, if available.

Note: Run the generator set monthly whenever possible.

4.8.1 Lubricating System

1. Operate the generator set until it reaches operating temperature, or about 15 minutes.
2. Stop the generator set.
3. While the engine is still warm, drain the engine lubrication oil from the engine crankcase.
4. Refill engine crankcase with oil. See Section 4.2.3 for oil recommendations.
5. Run the generator set for a few minutes to distribute the clean oil.
6. Stop the generator set.

4.8.2 Fuel System

1. Start the generator set.
2. With the generator set running, shut off the gas supply.
3. Run the generator set until the engine stops.
4. Press the OFF button on the generator set controller.

4.8.3 Cylinder Lubrication

1. Remove the spark plugs.
2. Pour one tablespoon of engine oil into each spark plug hole. Install the spark plugs and ground the spark plug leads. Do not connect the leads to the plugs.
3. Crank the engine two or three revolutions to lubricate the cylinders.

4.8.4 Exterior Preparation

1. Clean the exterior surface of the generator set.
2. Seal all openings in the engine with nonabsorbent adhesive tape.
3. Mask all areas to be used for electrical contact.
4. Spread a light film of oil over unpainted metallic surfaces to prevent rust and corrosion.

4.8.5 Battery

Perform battery storage last.

1. Press the OFF button on the generator set controller.
2. Disconnect the battery, negative (–) lead first.
3. Clean the battery.
4. Place the battery in a warm, dry location.
5. Connect the battery to a float/equalize battery charger, or charge the battery monthly using a trickle charger. Follow the battery charger manufacturer's recommendations.

5.1 Introduction

Use the troubleshooting charts in this section to diagnose and correct common problems. First check for simple causes such as a dead engine starting battery, loose connections, or an open circuit breaker. The charts include a list of common problems, possible causes of the problem, and recommended corrective actions.

If the procedures in this manual do not explain how to correct the problem, contact an authorized Kohler distributor/dealer. Maintain a record of repairs and adjustments performed on the equipment. Use the record to help describe the problem and repairs or adjustments made to equipment.

5.2 Fault Messages

The VSC controller displays fault messages to aid in troubleshooting. Selected fault messages and recommended checks are listed in Figure 2-5.

Identify and correct the cause of the fault condition. Then reset the controller after a fault shutdown. See Section 2.6.3.

5.3 Circuit Protection

If the generator set circuit breaker trips repeatedly, contact an authorized Kohler distributor/dealer for service.

5.3.1 Controller Internal Circuit Protection

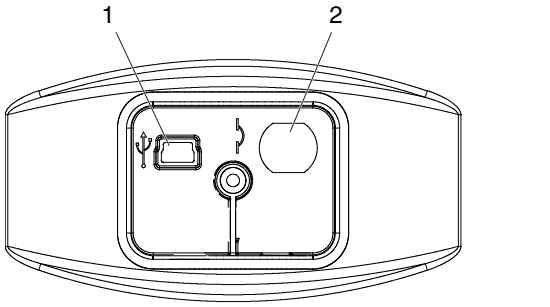
The controller is equipped with internal circuit protection. A fault message, Accy PwrOver Warning or MainPwrOverL Shutdown, is displayed if this internal protection is activated. Press OFF to reset. Contact an authorized Kohler distributor/dealer for service.

5.3.2 Line Circuit Breaker

The line circuit breaker interrupts the generator output in the event of a fault in the wiring between the generator and the load. If the circuit breaker trips, reduce the load and switch the breaker back to the ON position.

5.4 Controller Service Access

A USB port is located in the service access area (original controller) or on the front panel (revised controller). See Figure 5-1. Some controller settings can be adjusted using a laptop computer with Kohler SiteTech software. Use a USB cable with a mini-B connector to connect the controller to your PC. See TP-6701, SiteTech Software Operation Manual, for more information.



1. USB port (mini-B)
2. Not used

Figure 5-1 Controller Service Access (cover removed)

5.5 Troubleshooting

Figure 5-2 contains generator set troubleshooting, diagnostic, and repair information. Check for loose connections before replacing parts.

Problem	Possible Cause	Recommended Action
Controller display backlight is off.	Backlight turns off after about 1 minute with no activity.	Backlight will turn on when a button is pressed or the generator set starts.
Controller display is off.	Low or no battery voltage.	Check connections. Check generator set battery. See Figure 1-2.
The generator set does not crank.	Battery weak or dead.	Recharge or replace the battery.
	Battery connections reversed or poor.	Check the connections.
	Fault shutdown.	Check the controller display for fault messages. See Section 2.6. Correct the fault condition and reset the controller.
	Generator set in the OFF mode.	Press the RUN button to start the engine or press AUTO to allow remote starting.
The generator set cranks but does not start, starts hard, lacks power, or operates erratically.	Air cleaner clogged.	Clean and/or replace the air cleaner.
	Battery weak or dead.	Recharge or replace the battery.
	Battery connection poor.	Clean and tighten the battery connections.
	Spark plug wire connection loose.	Check the spark plug wires.
	Low oil pressure shutdown.	Check for oil leaks. Check the oil level and add oil if necessary.
	Fuel pressure insufficient.	Check the fuel supply and valves.
	Engine malfunction.	Contact an authorized Kohler distributor/dealer.
No DC output.	Line circuit breaker in the OFF position.	Place the circuit breaker in the ON position.
	Line circuit breaker tripping because of overload.	Reduce the load on the generator set.
	Line circuit breaker tripping because of short circuit.	Contact an authorized Kohler distributor/dealer for service.
	Rectifier has failed.	Verify that the generator is providing AC voltage.
Low output or excessive drop in voltage.	Generator set overloaded.	Reduce the load.
Generator set stops suddenly.	Low oil pressure shutdown.	Check for oil leaks. Check the oil level and add oil if necessary.
	Out of fuel.	Check fuel supply.
	Overcrank shutdown.	Reset the controller. If the overcrank fault occurs again, contact an authorized Kohler distributor/dealer.
	Auxiliary winding circuit breaker tripped.	Reset the circuit breaker (located in controller's service access area). Contact an authorized Kohler distributor/dealer for service if breaker trips repeatedly.
	Fault shutdown.	Check the controller display for fault messages. See Section 2.6. Correct the fault condition and reset the controller.
	Generator set in the OFF mode.	Press the RUN button to start the engine or press AUTO to allow remote starting.
	Remote stop command received from a remote switch, or OnCue®.	Check the remote switch position. Check OnCue®.
	Engine malfunction.	Contact an authorized Kohler distributor/dealer.

Figure 5-2 General Troubleshooting Chart

Appendix A Abbreviations

The following list contains abbreviations that may appear in this publication.

A, amp	ampere
ABDC	after bottom dead center
AC	alternating current
A/D	analog to digital
ADC	advanced digital control; analog to digital converter
adj.	adjust, adjustment
ADV	advertising dimensional drawing
Ah	amp-hour
AHWT	anticipatory high water temperature
AISI	American Iron and Steel Institute
ALOP	anticipatory low oil pressure
alt.	alternator
Al	aluminum
ANSI	American National Standards Institute (formerly American Standards Association, ASA)
AO	anticipatory only
APDC	Air Pollution Control District
API	American Petroleum Institute
approx.	approximate, approximately
APU	Auxiliary Power Unit
AQMD	Air Quality Management District
AR	as required, as requested
AS	as supplied, as stated, as suggested
ASE	American Society of Engineers
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
ATS	automatic transfer switch
auto.	automatic
aux.	auxiliary
avg.	average
AVR	automatic voltage regulator
AWG	American Wire Gauge
AWM	appliance wiring material
bat.	battery
BBDC	before bottom dead center
BC	battery charger, battery charging
BCA	battery charging alternator
BCI	Battery Council International
BDC	before dead center
BHP	brake horsepower
blk.	black (paint color), block (engine)
blk. htr.	block heater
BMEP	brake mean effective pressure
bps	bits per second
br.	brass
BTDC	before top dead center
Btu	British thermal unit
Btu/min.	British thermal units per minute
C	Celsius, centigrade
cal.	calorie
CAN	controller area network
CARB	California Air Resources Board
CAT5	Category 5 (network cable)
CB	circuit breaker
CC	crank cycle
cc	cubic centimeter
CCA	cold cranking amps
ccw.	counterclockwise
CEC	Canadian Electrical Code
cert.	certificate, certification, certified
cfh	cubic feet per hour
cfm	cubic feet per minute
CG	center of gravity
CID	cubic inch displacement
CL	centerline
cm	centimeter
CMOS	complementary metal oxide substrate (semiconductor)
com	communications (port)
coml	commercial
Coml/Rec	Commercial/Recreational
conn.	connection
cont.	continued
CPVC	chlorinated polyvinyl chloride
crit.	critical
CSA	Canadian Standards Association
CT	current transformer
Cu	copper
cUL	Canadian Underwriter's Laboratories
CUL	Canadian Underwriter's Laboratories
cu. in.	cubic inch
cw.	clockwise
CWC	city water-cooled
cyl.	cylinder
D/A	digital to analog
DAC	digital to analog converter
dB	decibel
dB(A)	decibel (A weighted)
DC	direct current
DCR	direct current resistance
deg., °	degree
dept.	department
dia.	diameter
DI/EO	dual inlet/end outlet
DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
DIP	dual inline package
DPDT	double-pole, double-throw
DPST	double-pole, single-throw
DS	disconnect switch
DVR	digital voltage regulator
E_2PROM, EEPROM	electrically-erasable programmable read-only memory
E, emer.	emergency (power source)
ECM	electronic control module, engine control module
EDI	electronic data interchange
EFR	emergency frequency relay
e.g.	for example (exempli gratia)
EG	electronic governor
EGSA	Electrical Generating Systems Association
EIA	Electronic Industries Association
EI/EO	end inlet/end outlet
EMI	electromagnetic interference
emiss.	emission
eng.	engine
EPA	Environmental Protection Agency
EPS	emergency power system
ER	emergency relay
ES	engineering special, engineered special
ESD	electrostatic discharge
est.	estimated
E-Stop	emergency stop
etc.	et cetera (and so forth)
exh.	exhaust
ext.	external
F	Fahrenheit, female
FHM	flat head machine (screw)
fl. oz.	fluid ounce
flex.	flexible
freq.	frequency
FS	full scale
ft.	foot, feet
ft. lb.	foot pounds (torque)
ft./min.	feet per minute
ftp	file transfer protocol
g	gram
ga.	gauge (meters, wire size)
gal.	gallon
gen.	generator
genset	generator set
GFI	ground fault interrupter
GND, ⏚	ground
gov.	governor
gph	gallons per hour
gpm	gallons per minute
gr.	grade, gross
GRD	equipment ground
gr. wt.	gross weight
H x W x D	height by width by depth
HC	hex cap
HCHT	high cylinder head temperature
HD	heavy duty
HET	high exhaust temp., high engine temp.
hex	hexagon
Hg	mercury (element)
HH	hex head
HHC	hex head cap
HP	horsepower
hr.	hour
HS	heat shrink
hsg.	housing
HVAC	heating, ventilation, and air conditioning
HWT	high water temperature
Hz	hertz (cycles per second)
IBC	International Building Code
IC	integrated circuit
ID	inside diameter, identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMS	mproved motor starting
in.	inch
in. H_2O	inches of water
in. Hg	inches of mercury
in. lb.	inch pounds
Inc.	incorporated
ind.	industrial
int.	internal
int./ext.	internal/external
I/O	input/output
IP	internet protocol
ISO	International Organization for Standardization
J	joule
JIS	Japanese Industry Standard
k	kilo (1000)
K	kelvin
kA	kiloampere
KB	kilobyte (2^{10} bytes)
KBus	Kohler communication protocol
kg	kilogram
kg/cm^2	kilograms per square centimeter
kgm	kilogram-meter
kg/m^3	kilograms per cubic meter
kHz	kilohertz

kJ	kilojoule
km	kilometer
kOhm, kΩ	kilo-ohm
kPa	kilopascal
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt ampere
kVAR	kilovolt ampere reactive
kW	kilowatt
kWh	kilowatt-hour
kWm	kilowatt mechanical
kWth	kilowatt-thermal
L	liter
LAN	local area network
L x W x H	length by width by height
lb.	pound, pounds
lbm/ft^3	pounds mass per cubic feet
LCB	line circuit breaker
LCD	liquid crystal display
LED	light emitting diode
Lph	liters per hour
Lpm	liters per minute
LOP	low oil pressure
LP	liquefied petroleum
LPG	liquefied petroleum gas
LS	left side
L_{wa}	sound power level, A weighted
LWL	low water level
LWT	low water temperature
m	meter, milli (1/1000)
M	mega (10^6 when used with SI units), male
m^3	cubic meter
m^3/hr.	cubic meters per hour
m^3/min.	cubic meters per minute
mA	milliampere
man.	manual
max.	maximum
MB	megabyte (2^{20} bytes)
MCCB	molded-case circuit breaker
MCM	one thousand circular mils
meggar	megohmmeter
MHz	megahertz
mi.	mile
mil	one one-thousandth of an inch
min.	minimum, minute
misc.	miscellaneous
MJ	megajoule
mJ	millijoule
mm	millimeter
mOhm, mΩ	milliohm
MOhm, MΩ	megohm
MOV	metal oxide varistor
MPa	megapascal
mpg	miles per gallon
mph	miles per hour
MS	military standard
ms	millisecond
m/sec.	meters per second
mtg.	mounting
MTU	Motoren-und Turbinen-Union
MW	megawatt
mW	milliwatt
µF	microfarad
N, norm.	normal (power source)
NA	not available, not applicable
nat. gas	natural gas
NBS	National Bureau of Standards
NC	normally closed
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	newton meter
NO	normally open
no., nos.	number, numbers
NPS	National Pipe, Straight
NPSC	National Pipe, Straight-coupling
NPT	National Standard taper pipe thread per general use
NPTF	National Pipe, Taper-Fine
NR	not required, normal relay
ns	nanosecond
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OF	overfrequency
opt.	option, optional
OS	oversize, overspeed
OSHA	Occupational Safety and Health Administration
OV	overvoltage
oz.	ounce
p., pp.	page, pages
PC	personal computer
PCB	printed circuit board
pF pic	ofarad
PF	power factor
ph., Ø	phase
PHC	Phillips head Crimptite (screw)
PHH	Phillips hex head (screw)
PHM	pan head machine (screw)
PLC	programmable logic control
PMG	permanent magnet generator
pot	potentiometer, potential
ppm	parts per million
PROM	programmable read-only memory
psi	pounds per square inch
psig	pounds per square inch gauge
pt.	pint
PTC	positive temperature coefficient
PTO	power takeoff
PVC	polyvinyl chloride
qt.	quart, quarts
qty.	quantity
R	replacement (emergency) power source
rad.	radiator, radius
RAM	random access memory
RBUS	RS-485 proprietary communications
RDO	relay driver output
ref.	reference
rem.	remote
Res/Coml	Residential/Commercial
RFI	radio frequency interference
RH	round head
RHM	round head machine (screw)
rly.	relay
rms	root mean square
rnd.	round
RO	read only
ROM	read only memory
rot.	rotate, rotating
rpm	revolutions per minute
RS	right side
RTDs	Resistance Temperature Detectors
RTU	remote terminal unit
RTV	room temperature vulcanization
RW	read/write
SAE	Society of Automotive Engineers
scfm	standard cubic feet per minute
SCR	silicon controlled rectifier
s, sec.	second
SI	*Systeme international d'unites,* International System of Units
SI/EO	side in/end out
sil.	silencer
SMTP	simple mail transfer protocol
SN	serial number
SNMP	simple network management protocol
SPDT	single-pole, double-throw
SPST	single-pole, single-throw
spec	specification
specs	specification(s)
sq.	square
sq. cm	square centimeter
sq. in.	square inch
SMS	short message service
SS	stainless steel
std.	standard
stl.	steel
tach.	tachometer
TB	terminal block
TCP	transmission control protocol
TD	time delay
TDC	top dead center
TDEC	time delay engine cooldown
TDEN	time delay emergency to normal
TDES	time delay engine start
TDNE	time delay normal to emergency
TDOE	time delay off to emergency
TDON	time delay off to normal
temp.	temperature
term.	terminal
THD	total harmonic distortion
TIF	telephone influence factor
tol.	tolerance
turbo.	turbocharger
typ.	typical (same in multiple locations)
UF	underfrequency
UHF	ultrahigh frequency
UIF	user interface
UL	Underwriter's Laboratories, Inc.
UNC	unified coarse thread (was NC)
UNF	unified fine thread (was NF)
univ.	universal
URL	uniform resource locator (web address)
US	undersize, underspeed
UV	ultraviolet, undervoltage
V	volt
VAC	volts alternating current
VAR	voltampere reactive
VDC	volts direct current
VFD	vacuum fluorescent display
VGA	video graphics adapter
VHF	very high frequency
W	watt
WCR	withstand and closing rating
w/	with
WO	write only
w/o	without
wt.	weight
xfmr	transformer

Notes

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